BY ORDER OF THE
SECRETARY OF THE AIR FORCE

AIR FORCE MANUAL 36-2227, VOLUME 1
1 FEBRUARY 1996

Personnel

COMBAT ARMS TRAINING AND MAINTENANCE (CATM) TRAINING MANAGEMENT AND RANGE OPERATIONS

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This manual provides procedures and guidance for CATM section management, firearms training programs, range operation and management, and weapons maintenance. It also contains facility criteria for CATM facilities. Use it in conjunction with Air Force Instruction (AFI) 36-2226 and Air Force Handbook (AFH) 36-2244. Attachment 1 is a list of references, acronyms, and abbreviations used in this publication. It also contains a list of Air Force Publications and Technical Orders (T.O.) to use in conjunction with AFI 36-2226, Air Force Manual (AFMAN) 36-2227, Volumes 1, 2, and 3, and AFH 36-2244.

Process proposed supplements as required by AFI 37-160, Volume 2, *Air Force Publications and Forms Management Programs--Developing and Processing Publications.*

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Paragraph

Page

Figures

Page

Chapter 1

TRAINING MANAGEMENT, CATM PERSONNEL

1.1. Purpose. Gives guidance for upgrade training, weapons qualification, and combat arms personnel evaluations.

1.2. Personnel Training, Evaluation, and Proficiency Requirements. CATM superintendents or noncommissioned officers in charge (NCOIC) must make sure assigned instructors are trained and evaluated and are provided opportunities to maintain skill proficiency. They must also:

- Orient newly assigned personnel on all phases of CATM operations.
- Make sure newly assigned personnel read all operating instructions (OI) and other material unique to the particular CATM section.
- Provide on-the-job training (OJT), upgrade, and qualification training for personnel in areas where they have not been previously qualified.

1.2.1. **Upgrade Training**. The supervisor and unit training manager will enter personnel into appropriate upgrade training according to AFI 36-2202, *Enlisted Specialty Training*, and any applicable supplements. The supervisor will formally assign a trainer for personnel requiring OJT and will submit an AF Form 1284, **Training Quality Report (TQR),** when required.

1.2.2. **Qualification Training**. The supervisor will enter personnel into qualification training when applicable. Document this training on the Specialty Training Standard (STS) or an AF Form 797**, Job Qualification Standard Continuation/Command (JQS)**. File the AF Form 797 in the individual's AF Form 623, **On-the-Job Training Record**, according to AFI 36-2202. Enter tasks the combat arms specialist or technician performs that are not listed in the current Air Force specialty code (AFSC) 3P1XX STS on the continuation sheet. See AFI 36-2202 for further guidance on completing an AF Form 797.

1.2.3. **Weapons Maintenance Evaluations**. Superintendents and NCOICs will develop a system of evaluations for their personnel who conduct weapons inspections and maintenance. This is an integral part of combat arms personnel training. Evaluations should include, but are not limited to, accomplishing and identifying procedures for:

- Scheduling weapons inspections and maintenance.
- Use of technical orders (T.O.).
- Use of required gauges, fixtures, tools, etc.
- Troubleshooting suspected weapon malfunctions.
- Function firing of repaired weapons, when applicable.
- Completing required documentation; i.e., weapons parts accountability, AFTO Form 105**, Inspection Maintenance Firing Data for Ground Weapons**, and appropriate DD forms.

1.2.4. **Training Evaluations**. Newly assigned personnel not previously certified for lead instructor duties will undergo three instructor training evaluations before being lead instructor task qualified. Evaluations are to determine an individual's training progress and identify areas requiring improvement. Satisfactory completion of this evaluation authorizes an individual to perform lead instructor duties without supervision for that particular type weapon.

- Section OJT supervisor, individual's trainer, or immediate supervisor will conduct training evaluations.
- The third evaluation may be for lead instructor certification if approved by the individual's trainer and immediate supervisor.
- Once lead instructor task qualified on one weapon, an individual need only satisfactorily complete a lead instructor evaluation for additional weapons for which they conduct training.
- Lead instructor evaluation will cover the complete Air Force Qualification Course, and the instructor being evaluated must perform tower-operator duties.
- All tasks performed for lead instructor evaluations must be rated "Satisfactory" or "Excellent."
- CATM superintendent or NCOIC must conduct the lead instructor evaluation.

1.2.5. **Weapon Qualification**. The superintendent or NCOIC is responsible for weapon qualifications of assigned personnel. CATM personnel will maintain qualification with the weapons and on the courses for which they personally provide training (instruction). They will also maintain qualification on any additional weapons for which they have an armed duty requirement. Document training on AF Form 522, **USAF Ground Weapons Training Data**, or computer-generated version. File documentation at the CATM section.

1.2.6. **Instructor Proficiency Training.** The superintendent or NCOIC will establish policies for use of authorized instructor proficiency ammunition. (See AFCAT 21-209, **Ground Munitions**.) These policies should permit and encourage assigned personnel to gain additional firearms proficiency and become a more skilled instructor force.

1.2.7. **Firearms Competitions.** An excellent means of building firearms proficiency throughout the military community is participation in competitions. AFCAT 21-209 provides allowances for matches conducted as outlined in AFI 34-127, *Excellence in Competition*, and other competitions between security police units and local law enforcement agencies.

1.3. Recurring Instructor Evaluations. CATM personnel who routinely perform duties as lead instructors will have regular evaluations as a means of making sure the highest possible standards are maintained and to maximize standardization of training.

1.3.1. **Semiannual Evaluations.** Evaluate individuals semiannually after they complete lead instructor certification. In addition to the required evaluations, evaluations on a "no-notice" basis are encouraged. "No-notice" evaluations done within the timeframe for required evaluations may be applied toward semiannual evaluation requirements. Do not perform two consecutive evaluations on the same program of instruction. The evaluator must be present for at least 1 hour of classroom instruction and at least 1/2 hour of live-fire training for the semiannual evaluation. The instructor being evaluated must perform tower operator duties.

1.3.2. **Who Conducts Evaluations.** The CATM superintendent or NCOIC must conduct lead instructor evaluations and at least one of the two semiannual evaluations. The CATM superintendent and NCOIC are evaluated by their supervisor. The CATM superintendent may evaluate the NCOIC. The MAJCOM CATM program manager or MAJCOM CATM standardization and evaluation team members may also accomplish lead instructor and semiannual evaluations. The evaluator will critique each instructor evaluated. Conduct the critique within 2 workdays following the evaluation. Only the instructor and evaluator need be present during the critique. If instructor performance was unsatisfactory, the instructor, evaluator, and CATM superintendent or NCOIC should be present.

1.3.3. **Additional Training.** A qualified instructor must provide additional training for an instructor rated "Unsatisfactory" in any area. Give a follow-up evaluation within 30 days. Upgrade unsatisfactory areas to satisfactory before permitting the individual to perform lead instructor or tower operator duties. If an instructor receives an "Unsatisfactory" rating on a formal evaluation and the follow-up evaluation, the CATM superintendent or NCOIC will make a recommendation to the commander that the individual receive further training or be removed from instructor status.

1.3.4. **Criteria for Evaluation.** The CATM section may add to the instructor evaluation checklist (See figure 1.1) or rate items as nonapplicable (N/A). Use the following scale to rate each item:

E - Excellent
S - Satisfactory
U - Unsatisfactory
N/A - Not applicable

NOTE: Document evaluation results on AF Form 1098, **Special Task Certification and Recurring Training**, or approved automated system and file it the CATM section. Maintain completed evaluation checklists for 1 year from completion date, then dispose of them or return them to the individual. Retain the evaluation checklists for 1 year after unsatisfactory areas are upgraded to satisfactory. Establish proficiency folders to maintain instructor evaluations for senior noncommissioned officers who require evaluations but do not require an AF Form 623.

Figure 1.1. Sample Instructor Evaluation Checklist.

Instructor's Name:_____ Grade:_____ Date:_____
Type of Training:_____ Type of Evaluation:_____
Number of Students:_____
Evaluator's Name:_____ Grade:_____ Title:_____

Evaluation Items	Rating	E	S	U	N/A

Section I - Projected Impressions.
- A. Personal Appearance.
- B. Classroom Preparation.

Section II - Lesson Plan Usage.
- A. Introduction.
  - (1) Attention.
  - (2) Motivation.
  - (3) Overview.
- B. Body (Organization, Transitions, and Motivation).
  - (1) Safety:
    - a. Basic weapon safety.
    - b. Clearing procedures.
    - c. Carrying procedures.
  - (2) Weapon Description and Operation:
    - a. External nomenclature.
    - b. Characteristics.
    - c. Cycle of operation.
    - d. Loading.
    - e. Reloading.
    - f. Unloading.
    - g. Malfunctions and stoppages.
    - h. Immediate and remedial action procedures.
    - i. Ammunition types and uses.
    - j. Destruction procedures.
  - (3) Mechanical Training:
    - a. Clearing procedures.
    - b. Disassembly.
    - c. Internal nomenclature.
    - d. Operator maintenance.
    - e. Inspection.
    - f. Assembly.
    - g. Function check.
    - h. Tripod and vehicle mounting.
    - i. Mechanical zero.
  - (4) Premarksmanship Training:
    - a. Sight alignment.
    - b. Sight picture.
    - c. Breath control.
    - d. Trigger control and manipulation.
    - e. Follow through.
    - f. Grip and stock weld.
    - g. Positions.
    - h. Errors and effect.
    - i. Battle sight zero.
    - j. Trajectory.

Figure 1.1 Continued.

k. Wind drift.
l. Hold over and under techniques.
m. Target engagements.
n. Crew drills.
o. Range cards.

C. Conclusion.
(1) Summary.
(2) Remotivation.
(3) Closure.

D. Teaching Techniques.
(1) Explanations.
(2) Demonstrations.
(3) Questioning techniques.

E. Use of Training Aids.

F. Personal Characteristics.
(1) Sincerity.
(2) Enthusiasm.
(3) Eye contact.
(4) Platform presence.
(5) Self-confidence.
(6) Distracting mannerisms.
(7) Rapport.

G. Speech Characteristics.
(1) Diction.
(2) Volume.
(3) Speaking rate.
(4) Clarity.

H. Classroom Management.
(1) Use of assistant instructors.
(2) Class control.
(3) Time usage.

I. Tower Operation.
(1) Instructor control.
(2) Student control.
(3) Enforcement of range safety.
(4) Use of range commands.
(5) Course of fire compliance.

J. Operator Maintenance.
(1) Instructor control.
(2) Student control.
(3) Conduct of required evaluations.

K. Annotation of AF Forms 522 and 710.

L. Completion of other required lead instructor duties.

OVERALL EVALUATION

Evaluator's Signature:_____ Date:_____

Evaluatee's Supervisor's Signature:_____ Date:_____

Evaluatee's Signature:_____ Date:_____

Comments:_____

Chapter 2

TRAINING PROCEDURES, FIREARMS TRAINING PROGRAMS

2.1. Purpose. An instructor must strive to create the best possible learning environment for the students. To do this requires a great deal of preparation. This chapter provides information to assist combat arms instructors to prepare for classroom and range activities.

2.2. Instructor Requirements. Table 2.1 provides requirements for personnel instructing in classroom and ranges.

2.3. Classroom Procedures. Good classroom procedures enhance student learning. Keep classes smooth-flowing and informative. Make sure all material is adequately covered and assistance is available for students experiencing difficulty with the material.

2.3.1. **Instruction Procedures**. Instructors will use appropriate lesson plans when conducting training. They will make sure all information is presented so students will acquire intended knowledge and skills. Presentations should not last more than 50 minutes without a break. In any event, provide regular breaks as instruction permits. Instructors will not leave students and or weapons unattended in the classroom, cleaning area, or on the firing range.

2.3.2. **Safety Procedures.** Follow safety procedures during all periods of instruction. (See applicable lesson plan, T.O., and OI.) No live ammunition, other than that carried by individuals fulfilling security responsibilities, is allowed in the classroom. Use dummy ammunition or empty cartridge cases for instructional purposes. Instructors performing security duties are prohibited from using their guard weapon for instructional purposes.

2.3.3. **Training Aids.** Many types of training aids are available to the combat arms instructor. Good training aids and techniques can shorten the time needed for teaching and learning. Training aids such as simulators, interactive video, sighting and aiming bars, and triangulation kits are especially helpful as they stimulate interest and involve the students. Other excellent training aids are: films, slides, video tapes, mockups, cutaways, chalkboards, magnet boards, and so forth, but instructors must use them wisely and with ingenuity.

2.4. Range Procedures. The following requirements are the minimum necessary for range operation.

2.4.1. **Inclement Weather.** The CATM section organizational commander will establish written guidelines for cancellation of training due to inclement weather. The final decision to conduct or cancel training rests with the commander, CATM superintendent or NCOIC, or in their absence, the senior instructor present on the range. AFP 160-1, *Prevention, Treatment and Control of Heat Injury*, provides detailed guidance on heat stress.

2.4.2. **Prefire Briefing.** The tower operator will brief all students on the course of fire. Briefing will include range and safety procedures, a reemphasis of shooting fundamentals, and evaluation procedures and criteria.

2.4.3. **Target Scoring**. Firing line instructors will score and record students' targets for evaluation phases.

2.4.4. **Range Policing**. Students will police the range of spent brass, litter, and other materials. Firing line instructors will make sure the students in their area police the range. The tower operator or a designated instructor will make sure other range facilities such as classrooms and cleaning areas are cleaned and policed.

2.5. Weapon Cleaning Procedures. Students will clean the weapons they use for training. Commanders of students in basic military training or officer training school and the 343th Training Squadron may establish an alternate weapons cleaning procedure. Instructors will make sure weapons are cleaned according to applicable T.O. Students are not authorized to clean the 5.56mm rifle conversion kit.

2.6. Student Evaluations. Instructors will evaluate students on the course of fire, required operator skills, preventive maintenance, and function check of the firearm.

2.7. Student Critique. Provide each student the opportunity to accomplish a written critique of all phases of the training program in which they participated. Inform the students of this at the beginning of training.

2.8. Documentation of Training:

2.8.1. Use AF Form 710, **Ground Weapons Training Record**, or a computer-generated version as a class roster and to provide a record of individual qualification, ammunition expenditure, range utilization, and firearm use. Complete the form according to figure 2.1. Students should sign the form after training is completed and rounds used, score, and status blocks are completed. File the Ground Weapons Training Record in the range office as the primary record of ammunition expended and training conducted. Retain it according to AFI 37-133, Volume 2, *Disposition of Air Force Records*--Records Disposition Schedule. CATM sections with an automated data system for tracking training will use and retain AF Form 710 as the source document.

2.8.2. Use AF Form 522, **US Air Force Ground Weapons Training Data**, or a computer-generated version to record course of fire, score, qualification status, and so on. complete AF Form 522 according to figure 2.2. The form may be initiated during the first period of training. Rounds fired, score, status, operator maintenance blocks, and both students' and range officials' signatures are annotated after completion of training. The individual's unit maintains the form to provide a record of training, to use as a scheduling aid, and to provide a cross-check of qualification. The AF Form 522 or computer-generated version, documents the qualification status, type firearm, date of qualification, and if appropriate, the individual's qualification for the award of the Small Arms Expert Marksmanship Ribbon. The student's unit of assignment initiates action to award the expert ribbon. The individual's unit sends the US Air Force Ground Weapons Training Data with the individual's training records when he or she is transferred. Units using an automated data system for tracking training will use AF Forms 522 as source documents.

2.8.2.1. Unit training sections will ensure the previous ground weapons training data record for each person scheduled for training is at the CATM section before class start time.

2.9. General Information Applicable to Combat Arms Training Courses:

2.9.1. Except for particular crew-served weapons, individuals should fire all qualification evaluation orders in one day. Students must complete qualification evaluations within 30 days of completion of mechanical and premarksmanship training.

2.9.2. Each shot not fired for any reason other than ammunition or weapon malfunction is counted as a miss. In the case of refires for malfunctions, the time allowed is prorated for the number of rounds remaining and the orders of fire. Return all rounds not fired for any reason (example: shooter does not get all rounds off within the time limit) to ammunition stocks for future use.

2.9.3. If an individual fails any part of the evaluation, the individual is unqualified (see exception in AFI 36-2226). After appropriate remedial training, an individual may attempt to requalify no more than twice. After the third failure to qualify, provide the individual's unit commander a written analysis of probable causes of failure. If the commander, after taking necessary action, determines the individual's duties require a firearm and recommends the individual for additional training, provide training on the portion the trainee failed, that is, either marksmanship or operator maintenance or both.

2.9.4. Everyone will wear hearing protection and all instructors will wear eye protection. CATM sections will make eye protection available for trainees who desire it during live fire.

2.9.5. When possible, individuals will fire the actual firearm they are or will be armed with. Do not remove firearms from extended storage packaging to comply with this requirement. In all cases, conduct training using government-owned issue firearms.

Table 2.1. Instructor Requirement.

RULE	A	B	C	D	E	F	G
	(See Note 1) If duty is	The individual must possess Primary Air Force Specialty Code of 3P151	3P171	3P190	3P100	(See Note 2) be task certified 3P131	(See Note 3) be qualified Group "A" personnel
1	Lead Instructor	X	X	X	X	X	
2	Assistant Instructor	X	X	X	X	X	X
3	See Notes 4-6 Tower Operator	X	X	X	X	X	
4	See Notes 7 & 8 Firing Line Instructor	X	X	X	X	X	X

Notes:

1. Instructor to student ratios (classroom and range) are specified in each of the firearms training programs in AFMAN 36-2227, volumes 2 and 3. Assistant instructors will help the lead instructor during demonstration, practical exercises, and performance evaluations. The minimum instructor number does not include the lead instructor.

2. For OJT purposes, a 3P131 may perform as lead instructor or tower operator under the direct supervision of a 3P151, 71, 90, or 3P100 until task certified.

3. Group A personnel are further defined as those who meet the requirements of AFI 36-2226.

4. The tower operator has responsibility and authority for safe and effective range operations during live fire training.

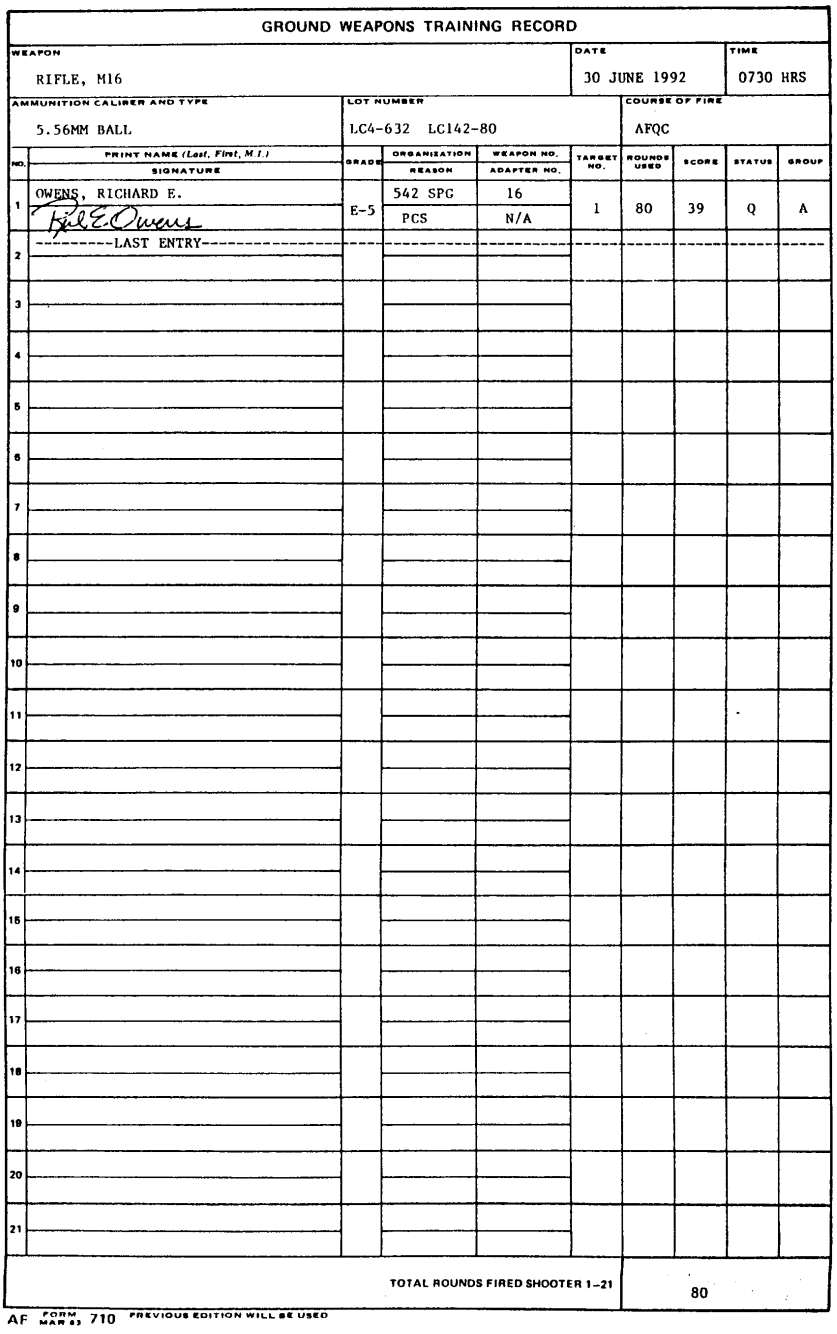
5. The tower operator will not coach students from the tower, but will ensure safety violations are corrected and will issue range commands.

6. The tower operator must monitor the complete range at all times paying particular attention to the firing line.

7. They are responsible for coaching and controlling students assigned to them and they are under the direction of the tower operator.

8. They will ensure all safety procedures and policies are followed.

Figure 2.1. AF Form 710, Ground Weapons Training Record.



GROUND WEAPONS TRAINING RECORD

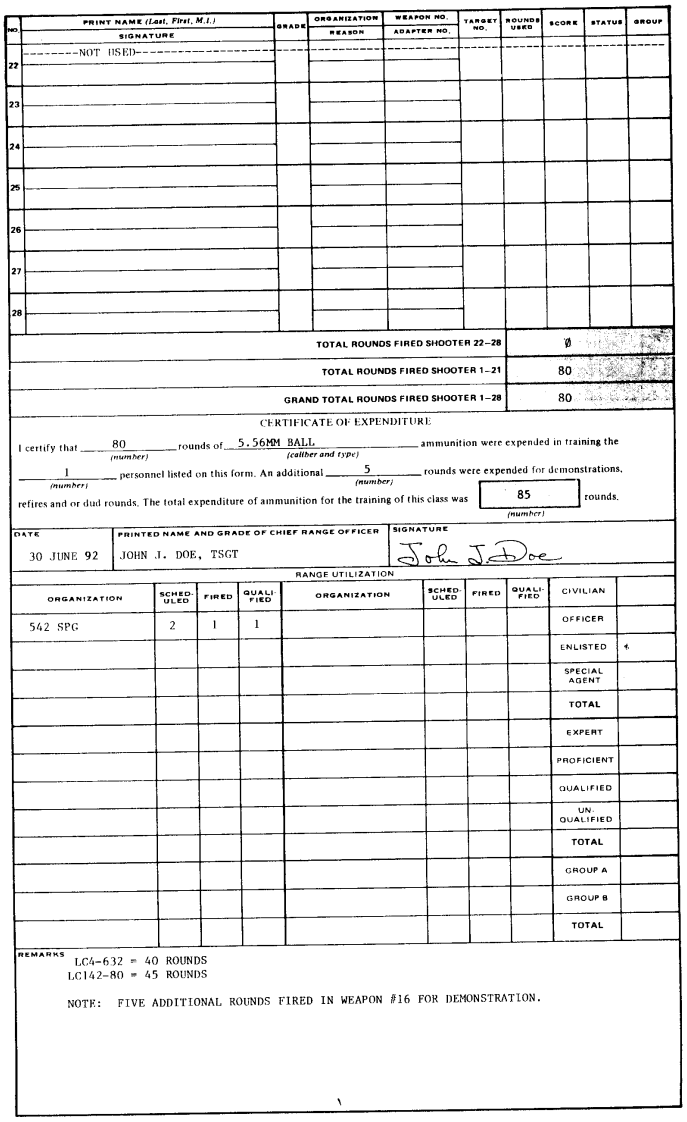
WEAPON	DATE	TIME
RIFLE, M16	30 JUNE 1992	0730 HRS

AMMUNITION CALIBER AND TYPE	LOT NUMBER	COURSE OF FIRE
5.56MM BALL	LC4-632 LC142-80	AFQC

NO.	PRINT NAME (Last, First, M.I.) / SIGNATURE	GRADE	ORGANIZATION / REASON	WEAPON NO. / ADAPTER NO.	TARGET NO.	ROUNDS USED	SCORE	STATUS	GROUP
1	OWENS, RICHARD E. Richard E. Owens	E-5	542 SPG PCS	16 N/A	1	80	39	Q	A
2	---------LAST ENTRY----------								
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
	TOTAL ROUNDS FIRED SHOOTER 1–21					80			

AF FORM MAR 83, 710 PREVIOUS EDITION WILL BE USED

Figure 2.2. AF Form 710, Ground Weapons Training Record. (Concluded).



NO.	PRINT NAME (Last, First, M.I.) / SIGNATURE	GRADE	ORGANIZATION / REASON	WEAPON NO. / ADAPTER NO.	TARGET NO.	ROUNDS USED	SCORE	STATUS	GROUP
	----------NOT USED----------								
22									
23									
24									
25									
26									
27									
28									

TOTAL ROUNDS FIRED SHOOTER 22–28	Ø
TOTAL ROUNDS FIRED SHOOTER 1–21	80
GRAND TOTAL ROUNDS FIRED SHOOTER 1–28	80

CERTIFICATE OF EXPENDITURE

I certify that 80 (number) rounds of 5.56MM BALL (caliber and type) ammunition were expended in training the 1 (number) personnel listed on this form. An additional 5 (number) rounds were expended for demonstrations, refires and or dud rounds. The total expenditure of ammunition for the training of this class was 85 (number) rounds.

DATE	PRINTED NAME AND GRADE OF CHIEF RANGE OFFICER	SIGNATURE
30 JUNE 92	JOHN J. DOE, TSGT	John J. Doe

RANGE UTILIZATION

ORGANIZATION	SCHED-ULED	FIRED	QUALI-FIED	ORGANIZATION	SCHED-ULED	FIRED	QUALI-FIED		
542 SPG	2	1	1					CIVILIAN	
								OFFICER	
								ENLISTED	4
								SPECIAL AGENT	
								TOTAL	
								EXPERT	
								PROFICIENT	
								QUALIFIED	
								UN-QUALIFIED	
								TOTAL	
								GROUP A	
								GROUP B	
								TOTAL	

REMARKS

LC4-632 = 40 ROUNDS
LC142-80 = 45 ROUNDS

NOTE: FIVE ADDITIONAL ROUNDS FIRED IN WEAPON #16 FOR DEMONSTRATION.

NOTES:

1. Separate entries for multiple qualification phases are not required. For multiple phases or tables, enter the total number of rounds fired, score as not applicable (N/A), and status as "Q" or "UQ". If the individual is unqualified, indicate in the remarks section which phases or tables the shooter failed.
2. The two right columns of the range utilization section are for local or MAJCOM use as required.

Figure 2.3. AF Form 522, US Air Force Ground Weapons Training Data.

WEAPON	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
M16 RIFLE						X							92

PRINTED NAME (Last, First, Middle Initial)	RANK	SSN	PRIMARY DUTY WEAPON
OWENS, RICHARD E.	SSGT	123-45-6789	M16 RIFLE

ORGANIZATION	PRINTED NAME AND GRADE OF RANGE OFFICIAL
542 SECURITY POLICE GROUP	JOHN J. DOE, TSGT

DUTY LOCATION/BASE	DUTY PHONE	CATM ORGANIZATION AND LOCATION
KIRTLAND AFB NM	6-6401	101 SPS/SPC, KIRTLAND AFB NM

DATE TRAINED	COURSE	MM/CAL	ROUNDS FIRED	SCORE	STATUS	DATE EXPIRES
30 JUN 92	AFQC	5.56	80	39	Q	31 DEC 92
PREVENTIVE MAINTENANCE EVALUATION	☐ PASS	☐ FAIL	☐ NA			
DATE TRAINED	COURSE	MM/CAL	ROUNDS FIRED	SCORE	STATUS	DATE EXPIRES
PREVENTIVE MAINTENANCE EVALUATION	☐ PASS	☐ FAIL	☐ NA			
DATE TRAINED	COURSE	MM/CAL	ROUNDS FIRED	SCORE	STATUS	DATE EXPIRES
PREVENTIVE MAINTENANCE EVALUATION	☐ PASS	☐ FAIL	☐ NA			
DATE TRAINLD	COURSE	MM/CAL	ROUNDS FIRED	SCORE	STATUS	DATE EXPIRES
PREVENTIVE MAINTENANCE EVALUATION	☐ PASS	☐ FAIL	☐ NA			

SIGNATURES	
SHOOTER	CATM OFFICIAL
Richard E. Owens	John J. Doe
SHOOTER	CATM OFFICIAL
SHOOTER	CATM OFFICIAL
SHOOTER	CATM OFFICIAL

AF FORM 522, FEB 91 *PREVIOUS EDITIONS ARE OBSOLETE* USAF GROUND WEAPONS TRAINING DATA

NOTES:

1. The month and year blocks on the top line of this form are for local use.
2. Separate entries for multiple qualification phases are not required. For multiple phases, enter the total number of rounds fired, score as N/A, and status as "Q" or "UQ". If the individual is unqualified, indicate in the remarks section which phases the shooter failed.

Figure 2.4. AF Form 522, USAF Ground Weapons Training Data (Detachable).

USAF FIREARMS QUALIFICATION
(DETACHED FROM AF FORM 522, FEB 91)

PRINTED NAME (Last, First, Middle Initial)	
OWENS, RICHARD E.	
SSN	RANK
123-45-6789	SSGT
SIGNATURE OF HOLDER (Not valid unless signed)	
Richard E. Owens	
ORGANIZATION	
542 SPG	

NOT TRANSERABLE-Card must be carried at all times when bearing Government firearms.
ERASURES INVALIDATE THIS CARD

The holder of this card is qualified with the firearm(s) specified

WEAPON	COURSE	DATE QUALIFIED	DATE EXPIRES
M16	AFQC	30 JUN 92	31 DEC 92

SIGNATURE OF CATM OFFICIAL
John J. Doe
PRINTED NAME AND GRADE OF CATM OFFICIAL
JOHN J. DOE, TSGT
CATM ORGANIZATION AND LOCATION
101 SPS/SPC, KIRTLAND AFB NM

Chapter 3

FACILITY CRITERIA

3.1. Chapter Purpose. This chapter provides general guidance for designing, programming, constructing, and testing CATM facilities. It establishes facility criteria and requirements applicable to all types of ranges. Ranges and other facilities designed and constructed using previously published criteria do not have to meet the requirements of this manual. When rehabilitation is accomplished, the criteria in this manual should be applied.

3.2. Range Type, Size, and Configurations. When determining range type, size, and configuration and types and sizes of range support facilities, the planner must consider factors such as the installation mission, real estate available, Headquarters US Air Force (HQ USAF) and MAJCOM policies, base population, annual training days available, training requirements, and the type weapons for which training is to be provided. Consider future requirements when planning new facilities and rehabilitation of existing facilities. Considerations should include training increases for small arms, crew-served weapons, and firearms simulators.

3.2.1. There are two basic types of ranges that may be constructed--impact and baffled. Following are brief descriptions of each:

3.2.1.1. **Impact Ranges.** Is an outdoor range with enough real estate where firing of approved weapons does not endanger people or property. The weapons' projectile will expend its energy during trajectory, regardless of the angle it was fired, and impact harmlessly within the range. An impact range is the most desirable type because it requires little maintenance and the type of weapons used is only limited by the amount of real estate available.

3.2.1.2. **Baffled Ranges.** An indoor or outdoor range system designed and constructed with overhead baffles, side walls or berms, and a backstop. When properly designed and constructed it prevents direct fired rounds and low-angled ricochets from leaving the range and minimizes the probability of other types of ricochets leaving the range. Outdoor baffled ranges may be built at any location with sufficient area for the range and the required clear danger area. Indoor baffled ranges may be needed on bases that experience at least 90 calendar days of adverse weather or have inadequate land area for an outdoor range. Indoor ranges do not require a clear surface danger zone. Baffled ranges may require ground baffles, a bullet catch, or deflector. Figures 3.1 and 3.4 show a typical baffled range.

3.2.2. Ranges may be constructed in multipurpose, superimposed, or special range configurations. Brief descriptions follow:

3.2.2.1. **Multipurpose Ranges**. The multipurpose range system allows simultaneous firing of more than one type of weapon. It is a range complex consisting of adjacent baffled or impact bays in which different types of weapons may be fired. A concrete wall or dirt berms that prevent bullets from entering adjacent bays separates the bays.

3.2.2.2. **Superimposed Ranges.** A superimposed range is either impact or baffled, allowing shooters to fire different types of weapons, although not simultaneously. Firearms such as rifles and pistols use common firing points and target lines. This type of range permits maximum use of available real estate and is usually less costly to construct than a multipurpose range.

3.2.2.3. **Special Ranges.** A special range system is usually an impact range, designed and constructed with multiple target lines or target arrays, and can be used for firing certain types of ground weapons or unique courses of fire.

3.3. Site Selection. When selecting a site to construct a range or range complex, make sure the area selected will meet all safety requirements for the weapons for which the range is designed. Take into consideration the direction of fire, climate, and general terrain.

3.3.1. Safety is the primary consideration when selecting a site for a range complex. The location of the Surface Danger Zone (SDZ) must be a major consideration. Do not orient ranges so the direction of fire is toward an inhabited area, aircraft runways, taxiways, or parking areas unless no other course of action is available. If at all possible, site the range so the morning and afternoon sun does not shine into the eyes of the shooter.

3.3.2. **Real Estate Availability:**

3.3.2.1. **Government-Owned.** US government-owned real estate possessed by the Air Force or other US services is the preferred property on which to locate a range. The base civil engineer (BCE) can provide information on government-owned real estate in the vicinity.

3.3.2.2. **Other Than US Government-Owned.** When US government-owned real estate is not available, it may be necessary to acquire privately owned real estate. After selecting a range site and preparing appropriate perimeter and boundary descriptions and layout maps of the proposed site, submit the real estate acquisition according to AFI 32-9001, *Acquisition of Real Property*. Where feasible, consolidate all ranges into one complex taking advantage of common areas and utilities. The BCE makes the formal request for the acquisition of real estate; therefore, submit requirements, together with complete and detailed justification to the BCE office.

3.3.3. **Geography and Climate.** Climate is an important factor that must be considered when selecting a site for a range. Snow in the northern climates, with the accompanying cold temperatures, can be avoided by constructing an indoor range. High winds can cause damage to overhead baffles on baffled ranges. Therefore, consider the prevailing wind direction and natural windbreaks when siting a baffled range. Plan access roads and parking areas so snow removal requirements are reduced. Plan the site to have maximum water runoff should unusual weather, such as hurricanes and heavy rains, occur.

3.4. General Range Design Criteria. Use the following criteria when planning and constructing any type of range or range complex.

3.4.1. Range construction must provide safe areas that permit accomplishment of the complete weapons training program.

3.4.2. Design should consider and provide for ease of range maintenance and upkeep and specify construction materials with a long-life expectancy. The desired life expectancy is at least 20 years.

3.4.3. Design should provide minimum life-cycle cost.

3.4.4. Range designs must meet AFOSH Standard 161-2 and provide for 100 percent containment of downrange direct fired rounds and low-angled ricochets (angles less than 45 degrees to the range floor). Materials used in construction or techniques of construction must minimize the probability of ricochets.

3.4.5. Range design must ensure that ricochets, if they occur, are directed away from the firing line and retained inside the range or leave the range at a 45 degree or greater upward angle. Ricochets that depart the range at an angle greater than 45 degrees will quickly expend their energy and fall harmlessly to the ground.

3.4.6. Design should provide vehicle access to complete range area and maintenance equipment access to backstop and side berm areas.

3.4.7. Design should allow room downrange for a moving and (or) pop-up target system.

3.4.8. Rifle, shotgun, and handgun ranges should have a minimum of seven firing points with a desired width of 5 feet per firing point (minimum width is 4 feet). These ranges must provide barricade-type devices at the firing line to simulate firing around buildings, over walls, and so forth.

3.4.9. Earthen berms or concrete walls may be used to separate ranges or firing bays so the bays can be used simultaneously and to protect areas around the range from direct fired shots or ricochets.

3.4.9.1. The distance from the base of an earth side berm to the outer edge of the first and last firing point must be at least 4 feet. For a machine gun range, the minimum distance is 5 feet.

3.4.9.2. Earth side berms may consist of fill substances such as broken concrete, asphalt, and so forth. The facing on all earth berms must have a minimum of 2 feet of rock-free soil.

3.4.9.3. To minimize erosion, a low retainer wall of concrete or wood may be used with an earthen berm.

3.4.10. Six-inch or thicker concrete or 8-inch or thicker concrete masonry unit walls are preferred instead of earth berms on ranges with target lines to 25 meters and as separators on multipurpose ranges.

3.4.10.1. When ranges are built using concrete walls, the distance from the wall to the outer edge of the first and last firing points must be at least 2 feet. On a machine gun range the distance must be at least 5 feet.

3.4.11. Provide a firing platform at least 10 feet deep with well-defined firing and ready lines. This provides room for the shooters, instructor movement, and areas for positive shooter control. The platform should slope 5 degrees to the rear (away from the target line) and be surfaced with concrete or asphalt. If unable to surface an impact range platform with concrete or asphalt, 1/4-inch or smaller pea gravel may be used. Number firing points from left to right with well-defined numbers. Use dark background with light numbers for odd numbered points and light background with dark numbers for even numbered points. Black and white are the recommended colors. Use a 4-inch wide red line located as close as possible to the front and extending the width (left to right) of the firing platform to identify the firing line. Identify the ready line by a 4-inch wide yellow line located at least 6 feet behind the firing line. On impact ranges, if stakes or wooden blocks with "v" notches are used to support unhandled rifles, identify the stakes with the proper firing point numbers.

3.4.12. Target lines for baffled ranges may be relocated for firing at different distances. On impact ranges, the target line may be fixed and several firing lines constructed to permit firing at different distances. Target lines must be parallel to the firing line and located at specified distances. Distances (firing line to target line) must remain constant from firing point to firing point. Targets are positioned at the target line on target frames, target turning mechanisms, pop-up mechanisms, or other suitable means of support. Targets must be clearly visible to the shooter. If possible, position targets so bullets do not hit the range floor before impacting the backstop. Identify the targets using the same color system as used for firing point identification.

3.4.13. Barricades are used on the firing line to simulate buildings, trees, walls, vehicles, and so forth. Usually, barricades are made of wood 2 inches thick by 6 inches wide in a "+" shape. When in position, horizontal barricade height is 48 inches above the firing line.

3.4.14. The range communications system must include communications between the range complex and the main

installation and a public address system for each range. There should be communications capability between individual ranges on a multiple range complex. If it is not practical to install landlines, or if a break-in landline service occurs, radio or cellular phone communications may be used.

3.4.15. Barriers, signs, and fences provide security and safety by preventing unauthorized people, animals, and vehicles from entering the range. Use barriers to block roads, walkways, or paths--where needed, use fences to keep people and animals out of the danger area.

- Indoor ranges seldom require barriers. Baffled and side-bermed ranges usually only require barriers for the range access road.
- Outdoor ranges that use a backstop and no baffles or that have an impact area in place of a backstop may require a number of barriers and signs to make the range safe.
- Use barriers to prevent vehicles and people from entering the impact area danger zone. Block paths with a heavy pole, gate, or a chain placed about 4 feet above the ground. Attach a reflective sign to the barrier to warn people of the danger within. Use a permanent barrier unless limited access is required. In such a case, provide for easy removal and replacement of the barrier.
- The number of barriers required depends on the number of roads, walkways, and paths that lead into the danger zone.
- Ranges or range complexes may require fences to prevent people, animals, and vehicles from entering the danger zone of the ranges. When needed, a close-mesh fence around the complete range complex, including the surface danger zone is desired. Fences also provide an excellent means to secure the range complex.
- An alternate method of preventing unauthorized entry into the range proper or into the danger zone is to block all normal approaches with barriers and signs. Typical range signs are shown in figure 3.2.
- For baffled ranges with dirt side berms and backstops, as a minimum, install a 6-foot high, close-mesh fence around the sides and back of the range. Locate the fence no closer than 15 feet to the berms and backstop.
- For baffled ranges with concrete walls and a dirt backstop, as a minimum, install the fence from one wall around the backstop to the other wall. Provide an access gate for maintenance equipment entry.

3.4.16. Combat arms facilities require latrine, water, electrical, heating, and air conditioning facilities. Base the latrine size on the number of people (instructors and trainees) supported.

3.4.16.1. Water must be available for drinking, sanitation, and flushing of skin and eyes. Where ranges are off base or in an extremely remote section of the installation, it may be more practical and less costly to drill a well and use a pressure pump system.

3.4.16.2. Electricity is required to light offices, operate power equipment for maintenance, and provide power to public address systems and target-turning mechanisms.

3.4.16.3. Heat and air conditioning is generally required for all indoor facilities (classrooms, offices, and so forth) and work areas (indoor ranges and weapons maintenance areas). In some geographic locations, it may be necessary to provide radiant heat for the firing lines of outdoor ranges. Use care in placing the utilities so they will not be damaged from normal firing. Do not place any utilities in front of the firing line, or 5 degrees to the right or left of the line of fire. When utilities are placed directly behind backstops or side berms, provide enough room for utility, berm, and backstop maintenance. Under-ground utilities may be placed anywhere on the range.

3.4.17. The type and volume of road traffic determine the type of construction and width of the roadway. Passenger vehicles and light or medium trucks generally use range-access roads. These roads must permit access to the ranges in all kinds of weather.

- Locate range-access roads so traffic approaches from the rear of the firing line when possible. The range-access road must never approach the range less than 40 degrees from the line of fire, except when a baffle or earthen berm completely protects the road from firing.
- Locate parking areas at least 50 feet to the rear of the firing line. On indoor or baffled ranges using side berms or walls, the parking area may be on either or both sides of the range. Normally, one parking space per firing point plus an allowance for range personnel is sufficient. Ranges with heavy training loads occasionally require two spaces per firing point. If possible, surface parking lots for all-weather operation.

3.5. Baffled Range Criteria. The information in this paragraph provides criteria for indoor or outdoor baffled range construction. Unless otherwise noted, the information is applicable to either indoor or outdoor construction. In all cases these criteria are additional to those in paragraph 3.4.

3.5.1. **Surface Danger Zone (SDZ) for Baffled Ranges.** A 300-yard SDZ is required for outdoor baffled ranges that do not have a bullet deflector or catch. See figure 3.3 for SDZ criteria.

3.5.2. **Baffle Requirements.** Design, build, and maintain baffles so they stop all direct fired bullets (figure 3.4). Ricocheting bullets may still fall outside the range even with a bullet deflector or catch in place.

3.5.2.1. **Canopy Baffles.** An angled or horizontal baffle attached directly over the firing line to the firing platform cover and extending downrange is the recommended method of preventing bullets from leaving the range between the firing line and the first overhead baffle. This baffle must prevent fired rounds (not ricochets) from exiting the range unless copper jacket is stripped, velocity is reduced, and angle of exit is more than 45 degrees. The bottom of the canopy baffle must be at least 7 feet 6 inches above the level of the firing line.

3.5.2.2. **Overhead Baffles.** Overhead baffles must not permit line of sight daylight when sighting downrange from 80 degrees to the right to 80 degrees to the left from any firing point, in any shooting position. The bottom of overhead baffles must be at least 7 feet 6 inches above the level of the firing line. Downrange overhead baffles may be mounted vertically or angled so the bottom edge is further downrange than the top. The first downrange baffle is positioned so a line drawn from the firing line under and touching the bottom edge of the canopy baffle intersects the first downrange baffle 4 inches from the top. To position the next downrange baffle, line of sight is taken from the firing line across the bottom of each baffle to a point 4 inches below the top of the succeeding baffle. The line drawn under the last downrange baffle must intersect the backstop no less than 6 feet from the top and at least 2 feet below the bullet catch, if installed.

3.5.2.3. **Ground Baffles.** Ground baffles are one method of preventing or controlling ricochets. Extreme care should be exercised when designing and building ground baffles as they may be a source of ricochets. Position ground baffles so any ricochets from the range floor are contained or impact into the backstop. Ground baffles may be used to protect target stands, target mechanisms, or other items installed on the range floor.

3.5.3. **Control Booth.** The control booth is usually a fixed, sheltered structure built on the back of the firing platform from where the tower operator controls range operations. See figure 3.5 for suggested range control booth design. On certain ranges, a stand similar to the one in figure 3.6 or a chair similar to the one in figure 3.7 may be a suitable operating facility for the tower operator. Use the following criteria during design of the control booth:

- For ranges with 14 or less firing points, the recommended location for the booth is on the right end of the firing platform.
- For ranges with more than 14 firing points, center the booth on the rear of the firing platform.
- Elevate the control booth floor sufficiently to permit the tower operator an unrestricted view of the range area to include all entry points to the range and firing platform.
- Do not position the forward edge of the booth closer than 8 feet to the firing line.
- The control booth should be at least 4-feet wide. This provides room for a supervisor and a combat arms specialist trainee. Control booth depth is as needed to meet local requirements.
- Provide a worktable or counter where the tower operator can place reference materials.
- As a minimum, provide light for the tower operator's worktable and at least one electrical outlet in the worktable area.

3.5.4. **Painting Facilities.** Paint the range structure with colors to add interest and blend with the local topography and architecture. Paint baffles and interior firing canopy ceiling white or a light color to help illuminate the firing line.

3.5.5. **Expansion Capability.** Ability to expand the range in increments of seven points is desirable.

3.5.6. **Berms (Outdoor Only)**. Berms, when required on a range, must be as high or higher than the top of the highest overhead baffle.

3.5.7. **Backstop Requirements.** A backstop must stop bullets fired on the range or deflect ricochets to an angle greater than 45 degrees. Criteria for metal backstops is applicable to either indoor or outdoor baffled ranges.

3.5.7.1. **Earthen Backstop.** Earth backstops are the most common type used on outdoor ranges. They may be used on indoor ranges; however, their use is not recommended. Locate the backstop at least 50 yards (45.7 meters) from the firing line to the centerline of the backstop. The distance from the last downrange target line and the closest part of the backstop should be at least 10 yards (9.2 meters). Construct the backstop high enough so a line drawn from the firing line under and touching the last downrange baffle intersects the backstop at least 6 feet below the top and at least 2 feet below the bullet catch, if installed. If the backstop is earth, the minimum depth of rock-free soil on the impact surface is 3 feet. If other materials such as a filler of asphalt, concrete, or timber are used in the construction of the backstop, the depth of rock free soil must be at least 6 feet. The slope of the backstop should be an angle of 35 to 45 degrees. Install a bullet deflector or bullet catch on the backstop if any or all of the following conditions exist:

- A 300-yard SDZ is not available.
- The front slope of the backstop is less than 35 degrees.
- Bullets are leaving the range at less than 45 degrees after hitting the backstop. (Because of the construction and maintenance problems with a bullet catch, a bullet deflector is preferred over the bullet catch (See figure 3.4 for an example of installation). The BCE will determine the most economical baffle and backstop combination for a baffled range.

3.5.7.2. **Metal Backstops.** Metal backstops are preferred on both indoor and outdoor baffled ranges. One type is

the 40-degree steel plate with a sand trap. A water or bullet trap are also acceptable. Other type backstops and bullet traps are available and may be used.

3.5.7.3. **General Specifications for Steel Plate Backstops.** Backstop tensile strength, minimum--190,000 psi, Brinell hardness--400-440, Thickness - 3/8 inch minimum recommended. CAUTION: Do not use steel, steel penetrating, armor-piercing, or incendiary cartridges. Do not fire ammunition with a bullet weight greater than 500 grains or ammunition with a muzzle velocity greater that 3,200 feet per second. If commercially designed range materials are used, ensure products meet or exceed standards for 5.56mm and 7.62mm ball ammunition.

3.5.7.4. **Backstop Construction Specifications.** Suspend the backstop deflector plate approximately 40 degrees from horizontal for the most effective angle of deflection. A 45-degree angle is permissible; however, the 40-degree angle deflects bullets with greater ease, and there is less metal fatigue and denting in the surface of the plate. The top edge of the deflector plate is nearest the firing line. Steel plates supported by concrete or masonry should be anchored by expansion bolts or toggle bolts with flush countersunk heads, not more than 12 inches on center at all edges of each plate. Place a continuous 1/2-inch plate, not less than 4 inches wide, behind joints and edge lines. Bolts shall pierce both facing and back plate. Expansion bolts shall penetrate concrete not less than 2 inches. Steel plates shall have milled edges at all joints. Joints shall be butted flush and smooth. Plates shall be free from buckle or wave after erection. Exposed edges shall be chamfered to a 45-degree angle, to a fillet approximately 1/6-inch thick. There shall be no horizontal joints in any steel plate work. Welding shall be according to the American Welding Society Code for Welding in Building Construction. Position steel plates so welds are no closer than 18 inches to center of target position. Steel plate jointed at and supported on structural steel supports shall be spot welded to steel supports not more than 6 inches on center. Locate metal backstops so the closest point is no closer than 5.5 yards (5 meters) to the last downrange target line.

3.5.7.5**. Bullet Traps.** The bullet trap must cover the entire area under the backstop and must be at least 8 inches deep. The trap should be mined of accumulated deposits on a regular basis. Remove lead only after consulting with bioenvironmental personnel. Strictly enforce established personal safety measures and rules for disposition of recovered lead and lead contaminated materials.

3.5.7.6. **Sand Traps.** Use dry sand to absorb the bullets deflected downward from the deflector plate. Make the sand trap the same size as the deflector plate and locate it directly under the plate. To help prevent ricochets, use fine granulated sand that is free of rocks. Do not use silica sand. Silica is a crystalline compound that can be in the form of sand. When used as sand, it may become solid and cause ricochets.

3.5.7.7. **Water Traps.** The inconvenience of cleaning a sand trap may lead to consideration of building a water trap. A water trap requires a water supply and a drain; but, cleaning a water trap is an easier task than cleaning a sand trap. One other advantage is it creates no dust, thereby reducing health hazards. Depending on national, state, and local environmental regulations, a water trap may require a filtration system in the water trap drain line.

3.5.8. **Range Surfaces.**

3.5.8.1. **Outdoor Range Surfaces.** Planting grass on berms, backstops, and range floors further improves ranges. When pea gravel is used to surface a range, use at least a 6-inch depth of 1/16- to 3/8-inch pea gravel with no more than 10 percent being 3/8 inch. Before surfacing with pea gravel, make sure the area to be covered is free from grass or weeds. Herbicides may be used before surfacing, or existing surface may be covered with a thick mill plastic that will retard growth. A smooth concrete floor with a slight down hill slope toward the backstop is permissible for surfacing outdoor ranges. Walkways should be located on either side of baffled ranges.

3.5.8.2. **Indoor Range Surfaces.** The desired covering for indoor range floors is smooth concrete with sealant. If pea gravel is used, use at least a 6-inch depth of 1/16-to 3/8-inch pea gravel with no more than 10 percent being 3/8 inch. Indoor ranges should have floor drains to allow for frequent flushing to eliminate lead contamination and unburned powder build-up. Remove lead only after consulting with bioenvironmental personnel. Strictly enforce established personal safety measures and rules for disposition of recovered lead and lead contaminated materials. Dirt or sand floors in indoor ranges are discouraged as they accumulate powder and lead debris and are very difficult to remove and replace.

3.5.9. **Drainage for Outdoor Ranges.** Designs must include provisions for proper drainage. Poor drainage may cause baffle bases, targets, sign emplacements, and roads to deteriorate or shift position. On outdoor ranges, where feasible, slope the range floor so the range drains from the firing platform towards the backstop. However, terrain features may make it desirable to provide drainage towards and to the sides of the firing platform. Use dirt or pea gravel to fill any low spots that develop. Make sure the ditches and other drainage facilities are large enough to carry normal runoff. If smooth concrete is used to surface an outdoor range, provide for proper drainage.

3.5.10. **Firing Line Canopy Cover (Outdoor Only).** The canopy cover should extend several feet forward of the firing line. Provide sufficient lighting to permit firing line cleanup.

3.5.11. **Windbreak (Outdoor Only).** Provision for an

easily installed windbreak is desirable.

3.6. Impact Range Criteria. Use the information in this paragraph and paragraph 3.4 when constructing an impact range.

3.6.1. **Control Towers.** The control tower provides a control center from where the tower operator can control all range activity for one specific impact range (figure 3.8). The following criteria apply to design and construction of control towers. On impact ranges with covered firing platforms, a control booth as described in paragraph 3.3 may be adequate.

3.6.1.1. Locate the tower in the center and behind the firing line area to provide an unrestricted view of all firing positions.

3.6.1.2. The floor of the control tower should be at least 5 feet above the firing platform level, but must be high enough to permit surveillance of impact areas. Construct the tower to withstand the highest winds normally expected.

3.6.1.3. Provide a work table or counter where reference materials may be placed.

3.6.1.4. Include provisions for a public address system.

3.6.1.5. Provide sufficient lighting for worktable and to permit firing line cleanup. Provide at least one electrical outlet in the worktable area.

3.6.1.6. Minimum size for the control tower platform is 4 by 8 feet. Locate the long sides parallel to the firing line.

3.6.2. **Range Danger Zones.** Range danger zone criteria establishes the minimum requirements for firing weapons on an impact range. Range danger zones consists of a SDZ and a vertical danger zone. The size of each zone is computed using the ballistic information in table 3.1 and the procedures in subparagraphs 3.6.2.1 through 3.6.2.9. Using this information, a Danger Area Plot Plan is established.

3.6.2.1. **SDZ.** The SDZ is the land area where fired rounds may land and, if needed, includes a weapon backblast area. See figures 3.9 and 3.10 for sample SDZs of rifle, handgun, shotgun, machine gun, and MK 19 40mm machine gun ranges. The SDZ consists of target, impact, ricochet, and secondary danger areas. Use the following information when establishing SDZs.

- The target area may be the same width or wider than the firing line width. It must be capable of supporting the courses of fire and types of weapons planned for the range.
- The impact area is the primary danger area established for the impact of all rounds. It is the area between the left and right limits of fire and extends downrange to maximum range of the ammunition to be used on the range.
- The ricochet area is the area between the impact area and the secondary danger area. To establish the required ricochet area, draw lines at a 10-degree angle to the impact area and originating from the intersection of the firing line and the left and right limits of fire. Extend the line to the maximum range of the ammunition to be used on the range.
- The secondary danger area is an area provided to contain fragments from items exploding or ricocheting on the left or right edge of the impact area.

3.6.2.2. To establish secondary danger areas for ranges with target areas the same width as the firing line area, do the following. At an angle of 40 degrees to the impact area, draw lines from the intersection of the firing line and the left and right limits of fire and extending outward for 1,000 meters. For weapons with ranges less than 3,100 meters, draw lines originating at the 1,000-meter points, parallel to the line of fire and extending to the maximum range of the weapon. For weapons with ranges greater than 3,100 meters, draw the lines from the 1,000-meter points to points 100 meters left and right of the ricochet areas at the maximum range of the ammunition to be used on the range.

3.6.2.3. To establish secondary danger areas for ranges with target areas wider than the firing line area, do the following. At an angle of 40 degrees to the impact area, draw lines from the intersection of the firing line and the left and right limits of fire and extending for 1,000 meters. Draw lines from the 1,000-meter points to points 100 meters left and right of the ricochet areas and extending to the maximum range of the ammunition to be used on the range.

3.6.2.4. SDZs for weapons other than those in the above paragraphs are shown in figure 3.11 through figure 3.13. Each weapon SDZ is specifically designed for that type of weapon. To ensure an adequate margin of safety, SDZs must be according to this criteria.

3.6.2.5. 40mm Grenade Launcher Range (figure 3.11) permits firing of 40mm low velocity grenades such as is fired from M79, M203, and XM148 grenade launchers. The entire surface of the impact area should be cleared of vegetation or clipped extremely close during mowing operations so the grenades will readily detonate on impact and so explosive ordnance disposal personnel can easily locate dud high explosive rounds for disposal. Construct targets in the target area using lumber, steel, or concrete. Terrain features, course of fire, and weather conditions will determine if a spotting tower is required for observation of the impact area. Observation is needed to note point of impact, for adjustment of fire, and for safety. Range personnel must be able to spot and mark dud rounds as they occur. A central tower high enough to permit visual observation of the entire range may be needed.

3.6.2.6. **Light Antitank Weapon (figure 3.12).** These ranges permits firing of the M72 66mm rocket and the M73 35mm subcaliber training device. The danger zone to the rear of the launcher must be clear of personnel, material, and vegetation. Layout firing points so individual backblast areas do not overlap.

3.6.2.7. **81mm Mortar (figure 3.13).** This range permits firing of the 81mm mortar.

3.6.2.8. **Vertical Danger Zone.** The vertical danger zone is the area above the SDZ that provides for the containment of the flight of a projectile or projectile ricochets. This zone consists of projectile maximum altitude from a specified launch angle plus a safety factor (table 3.1). The vertical danger zone extends vertically above the outer limits of the SDZ to the total maximum vertical distance of the type of ammunition to be used (See table 3.1 for this distance). Figure 3.14 shows a typical vertical danger zone. CATM sections using impact ranges where air space overlies the range will ensure the proper precautions for airspace safety are taken with the Federal Aviation Administration or appropriate authorities.

3.7. 10-Meter Machine Gun Range Criteria. The information in this paragraph provides criteria for 10-meter machine gun tube ranges. See figures 3.18 and 3.19.

3.7.1. **M60 Machine Gun Tubes.** Ten-meter machine gun range tubes must measure 6 feet inside diameter by 24 feet in length. They are to be reinforced concrete and must meet ASTM C76, Class III RCP requirements. For drainage, slope the tubes approximately 6 inches toward the target line. Firing positions will be at least 12 feet apart measured center to center. The end of the tube toward the shooter should touch the firing line. When firing is conducted, the muzzle of the machine gun must be inside the tube.

3.7.2. **Firing Platform.** Ensure tube placement and firing platform height are such that the muzzle of the machine gun is in the approximate center of the tube diameter. Consider constructing a recess 3 inches deep and large enough to accept a tripod. This will provide the capability to fire tripod mounted weapons.

3.7.3. **Backstop.** Locate the backstop at least 50 yards from the firing line to the centerline of the backstop. The height of the backstop is determined by drawing a line from the firing line to the backstop and intersecting the highest point the bullet could exit the target end of the tube. This line must intersect the backstop not less than 6 feet from the top and at least 2 feet below the bullet catch, if installed. With a bullet deflector or bullet catch installed, this range does not require a 300 yard SDZ. See paragraph 3.5.7 for additional backstop and bullet deflector criteria.

3.8. Range Support Facilities. A ground weapons range system requires several facilities to support its operation. Among these are a CATM building, provisions for storage of range supplies and equipment, and an area for target storage and repair.

3.8.1. **CATM Building (figure 3.15).** This building supports the activities of a CATM section. It contains space for classroom instruction, program administration, weapons maintenance, weapons cleaning and degreasing, alarmed weapons and ammunition storage, latrine facilities, and miscellaneous storage. It is used in conjunction with a ground weapons range system.

3.8.1.1. **Classroom.** Classrooms must contain sufficient space to provide each student a chair and a table work surface of at least 24 by 36 inches. Provide each student receiving machine gun, mortar, or recoilless rifle training a work surface of at least 34 by 45 inches. The classroom should contain a raised instructor's platform, aisle space for instructor access to individual tables, and provisions for video cassette equipment, 16mm movie projections, slide tape presentations, and overhead projection of viewgraphs. Table of Allowance (TA) 006 contains office and furniture authorizations.

3.8.1.2. **Administrative Space.** Provide an office with at least 140 square feet for the CATM Superintendent or NCOIC. Additionally, provide a minimum of 75 square feet per combat arms authorization.

3.8.1.3. **Weapon Maintenance Shop.** Provide a room or an area specifically designated for weapon maintenance. The area must contain sufficient space for workbenches, handtools, power tools, equipment, and spare parts storage cabinets, and provide a lavatory with potable water in the immediate area.

3.8.1.4**. Weapons Cleaning and Degreasing Room.** Provide sufficient space for workbenches, degreasing tanks, and spray hoods. Provide forced ventilation, vapor-proof electrical fixtures, compressed air service, and solvent resistant wall and ceiling finishes. Provide a lavatory with potable water in the immediate area.

3.8.1.5. **Alarmed Weapons and Ammunition Storage.** Training weapons and weapons being inspected or repaired require secure storage. Provide a room that meets the requirements of AFI 31-209, *Resource Protection Program*, and that contains sufficient area to store all weapons for which the CATM organization is responsible (temporarily and permanently) and the required quantities of ammunition.

3.8.1.6. **Latrines.** Provide latrine facilities for both men and women.

3.8.1.7. **Miscellaneous Storage.** Provide an area for storage of administrative supplies, training aids, classroom equipment, and other miscellaneous items. The size of this area is directly related to the type and quantity of training the CATM section conducts.

3.8.1.8. **Range Supplies and Equipment Storage Building.** This facility provides secure storage for miscellaneous range supplies, tools, and equipment.

3.8.1.9. **Range Target Storage and Repair Building**. This facility provides space for the secure storage and repair of targets. Provide an electrical power source for operating power tools.

3.9. Facility Certification. The BCE will make sure proper materials and construction techniques are used during construction or rehabilitation of a range. The range and range support facilities, when completed, must meet the requirements of this regulation and the appropriate design documents. The materials, distances, and angles are critical if safety margins are to be maintained. Technical advice, if needed, is available from

MAJCOM CATM program managers and HQ AFSPA/SPLT.

3.9.1. **Range Utilities.** Make a check of all utilities before acceptance. This includes, but is not limited to, lighting, outlets, faucets, latrine facilities, and heating and cooling equipment.

3.9.2. **Communication Systems.** Perform a communications acceptance check before range trial operations. Communication system must include telephone or radio service between the facility and the base, a public address system, and required duress alarms.

3.9.3. **Specifications Check.** Distances from firing lines to target lines are critical and must be measured during construction and on completion of the range. On baffled ranges, visually check both overhead and ground baffles to make sure they overlap so the shooter cannot see gaps between them. Overhead baffles must not permit line of sight daylight when looking downrange from any shooting position on any firing point between 80 degrees to the right and 80 degrees to the left.

3.9.4. **Test-Fire.** After construction or rehabilitation of a range and before operation for training and qualification, conduct a controlled test-fire to determine range safety adequacy. CATM personnel in conjunction with ground safety personnel will perform the test-fire. The most experienced shooter available will use the most powerful ammunition authorized for use on the range for the test. Make sure all fire hazards are removed from the range and areas surrounding the range. Make sure firefighting equipment is immediately available when conducting range tests using tracer ammunition.

3.9.4.1. **Impact Ranges.** A test-fire is not required for an impact range. After the specification check is completed, proceed to trial operations.

3.9.4.2. **Baffled Ranges.** The shooter will first fire downward into the baffles to determine if they will contain direct fired rounds. Next, from the prone position, fire into the backstop at the highest point possible. Bullet impact must meet criteria in paragraph 3.5.7. A test screen (witness) may be used to test ricochet potential of the range floor. A test screen is constructed by building a 4 feet by 4 feet, four-sided cube from celotex (NSN 5640-00-073-2803) or cardboard material (figure 3.16). Place the test screen at different areas on the range floor and fire into the range floor in front of the test screen at various angles from the firing line. To determine if ricochets would have left the range, sight along a small 3/16-inch diameter dowel placed through ricochet holes in the screen material. If the angle of departure is less than 45 degrees and the sighting verifies that the bullet left the range, corrective measures must be taken (figure 3.17). Conduct tracer tests using the same caliber of ammunition to be used on the range to determine patterns of ricochets. The use of tracer ammunition is the fastest and most efficient method of determining ricochet patterns and hazard potential.

3.9.5. **Trial Operations.** Trial operation of a new or rehabilitated range is mandatory. The CATM superintendent or NCOIC and base ground safety representative will be present during trial operations. Document the results of the trial operations in a range-trial operation report. Include one copy of the report in the CE construction package. The CATM section will retain an additional copy on file for 24 months. Include the following items in the report.

- Date of trial operation.
- Date of construction termination.
- Course of fire.
- Type of weapon, caliber, and ammunition.
- Target system functioning (may be mechanical or fixed).
- Number of people who fired.
- Firing points used.
- Any damage incurred or improperly func-tioning items.

3.10. Range Criteria Deviations. When a base is unable to construct or maintain ranges according to the specified criteria, request a deviation to the requirement not being met. The CATM superintendent or NCOIC, in coordination with the BCE and the base ground safety officer, develops the request and sends it through command channels, to the MAJCOM CATM program manager. If the MAJCOM chief of safety, SE, CE, and CATM program manager agree, the MAJCOM may approve the request. Before approving the requested deviation, the MAJCOM must make sure a reasonable degree of safety exists when the range is operated. Report deviations semiannually to HQ AFSPA/SPL IAW AFI 36-2226.

3.11. Deviation Preparation. Include in the deviation request the applicable base layout map (scale: 1 inch equals 400 feet or larger) denoting range site location and danger area distances. Include the following and any other pertinent information:

- Detailed justification of the deviation re-quirement.
- Specific requirements for which a deviation is needed.
- Length of time deviation is required.
- Location and distance to the nearest suitable alternate range facility, if applicable.
- Compensatory measures planned to minimize adverse effects of noncompliance with require-ments.
- Copy of the OI for operating the range with the deviation.

Figure 3.1. Typical Baffled Range.

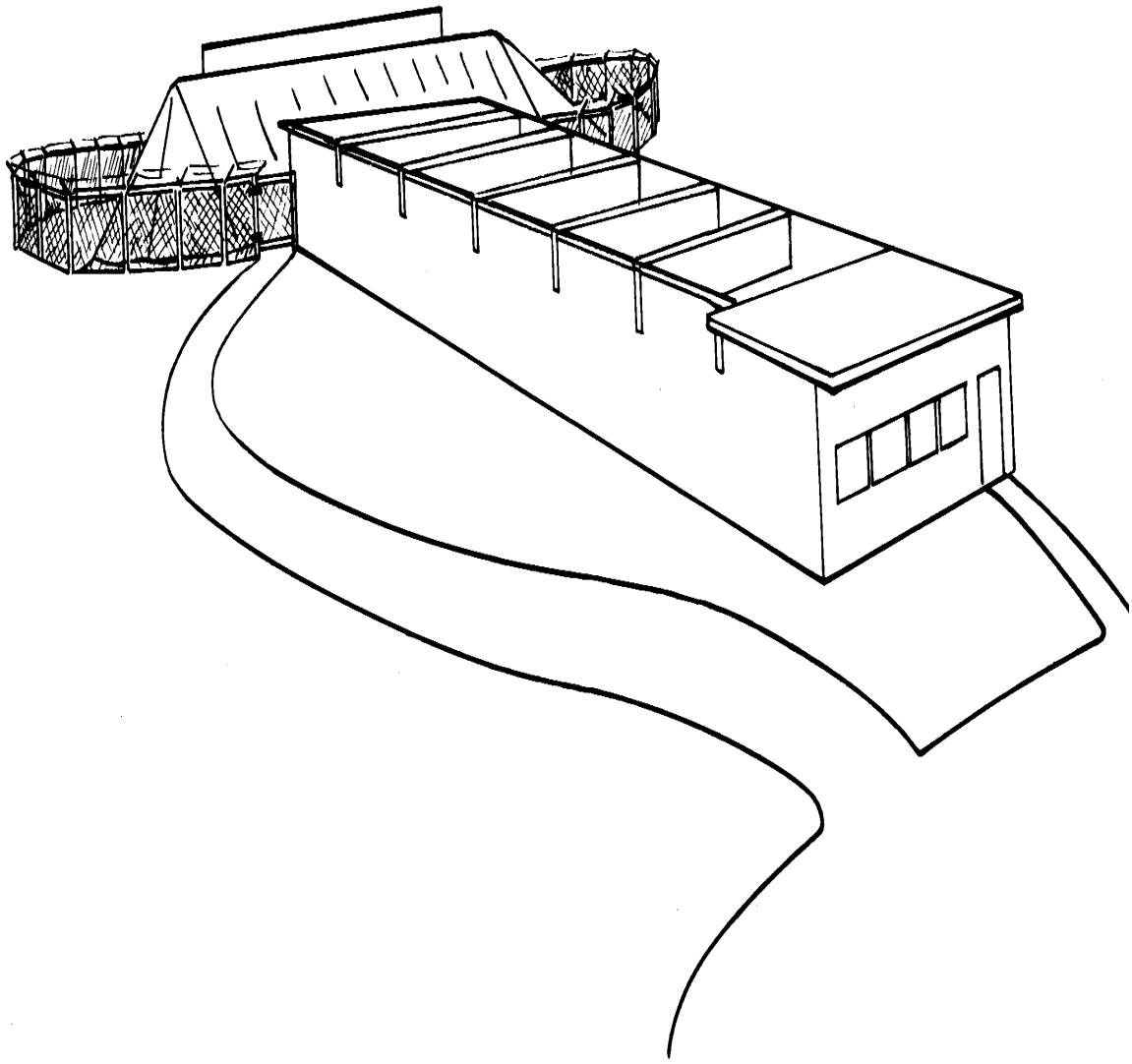


Figure 3.2. Range Signs.

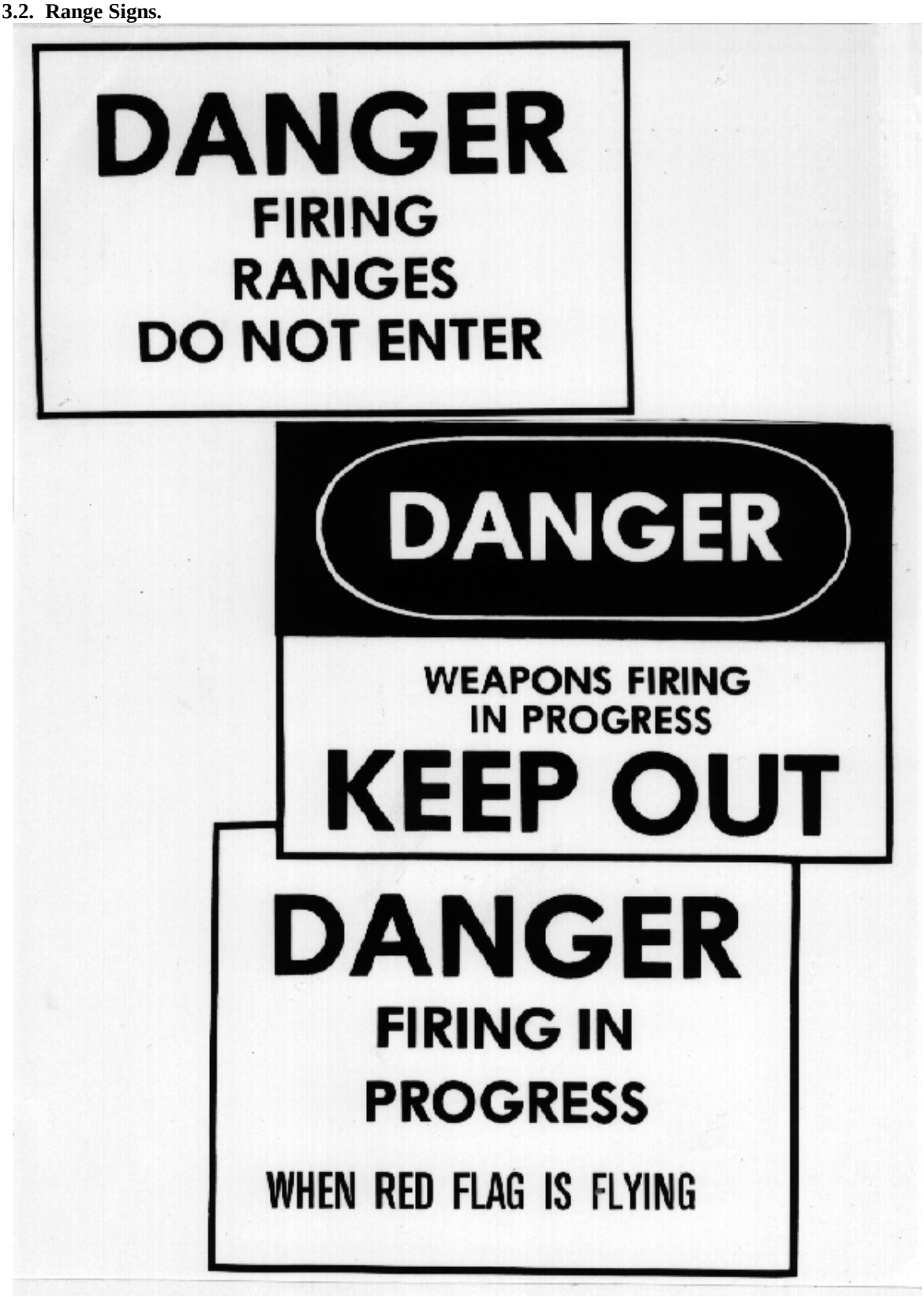


Figure 3.3. Surface Danger Zone for Baffled Ranges.

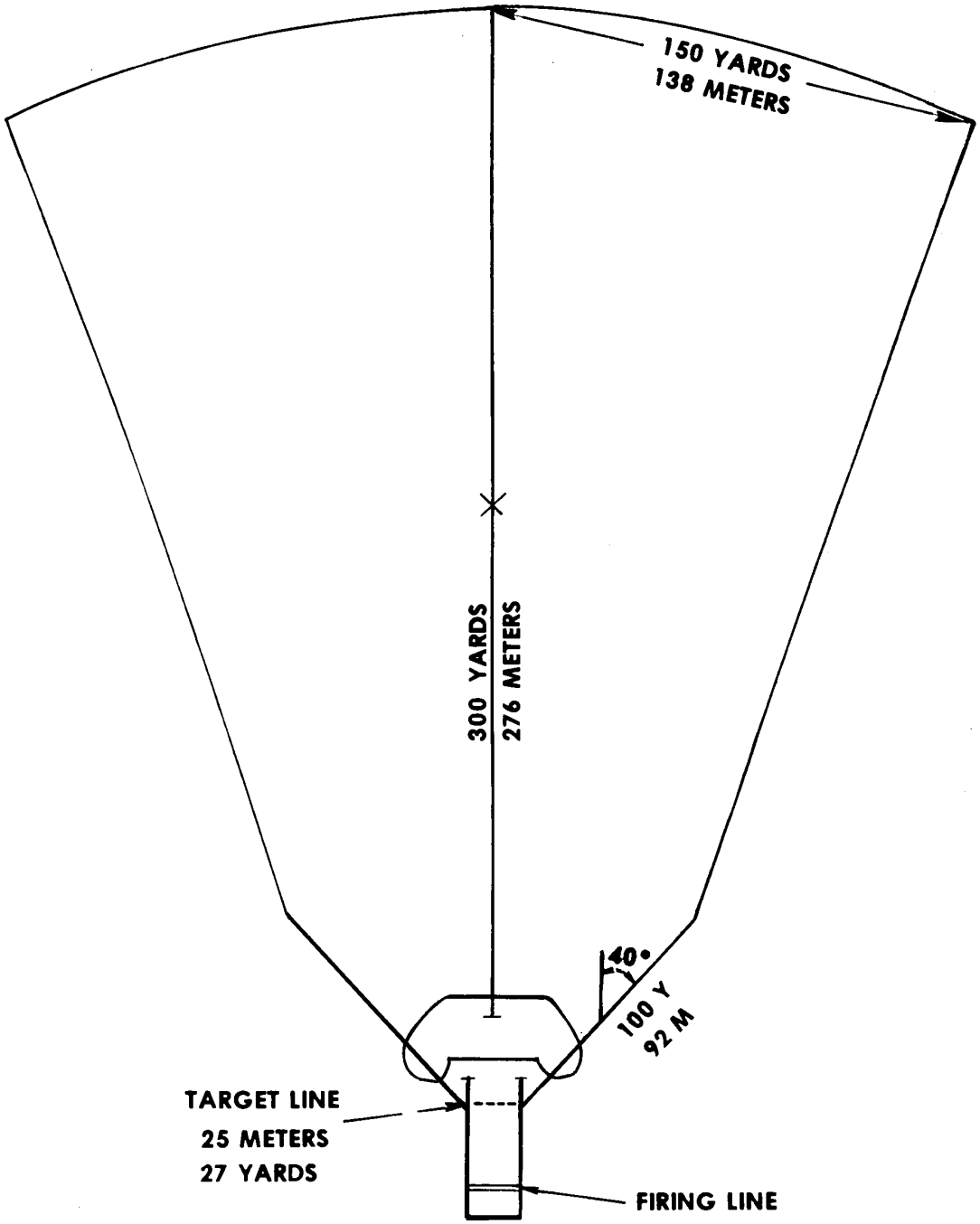


Figure 3.4. Baffled Designs.

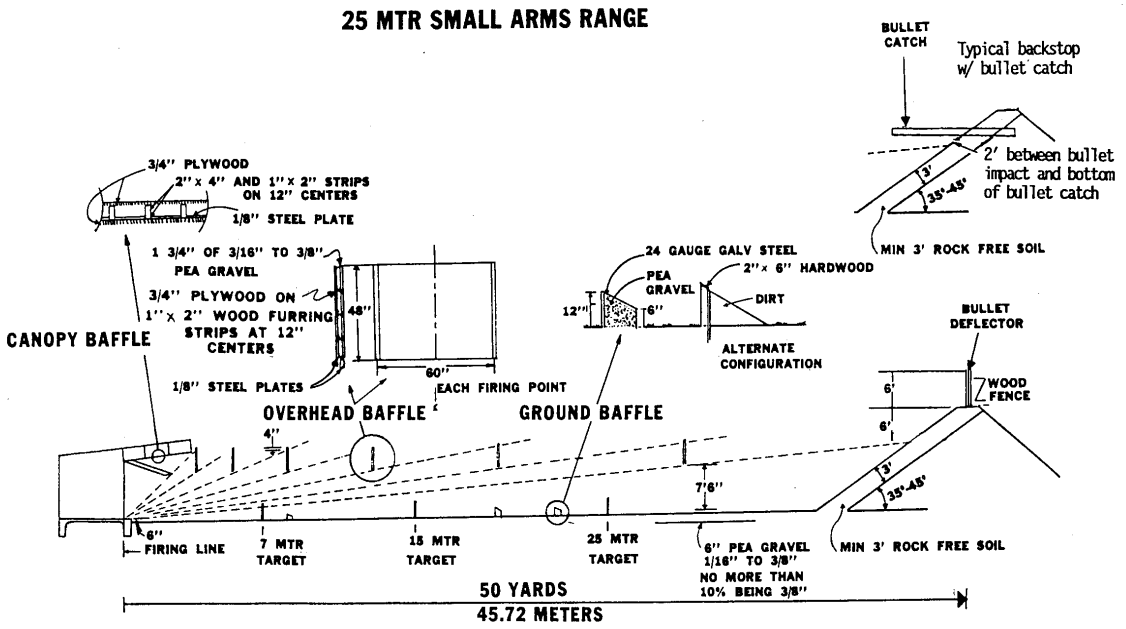


Figure 3.5. Range Control Booth.

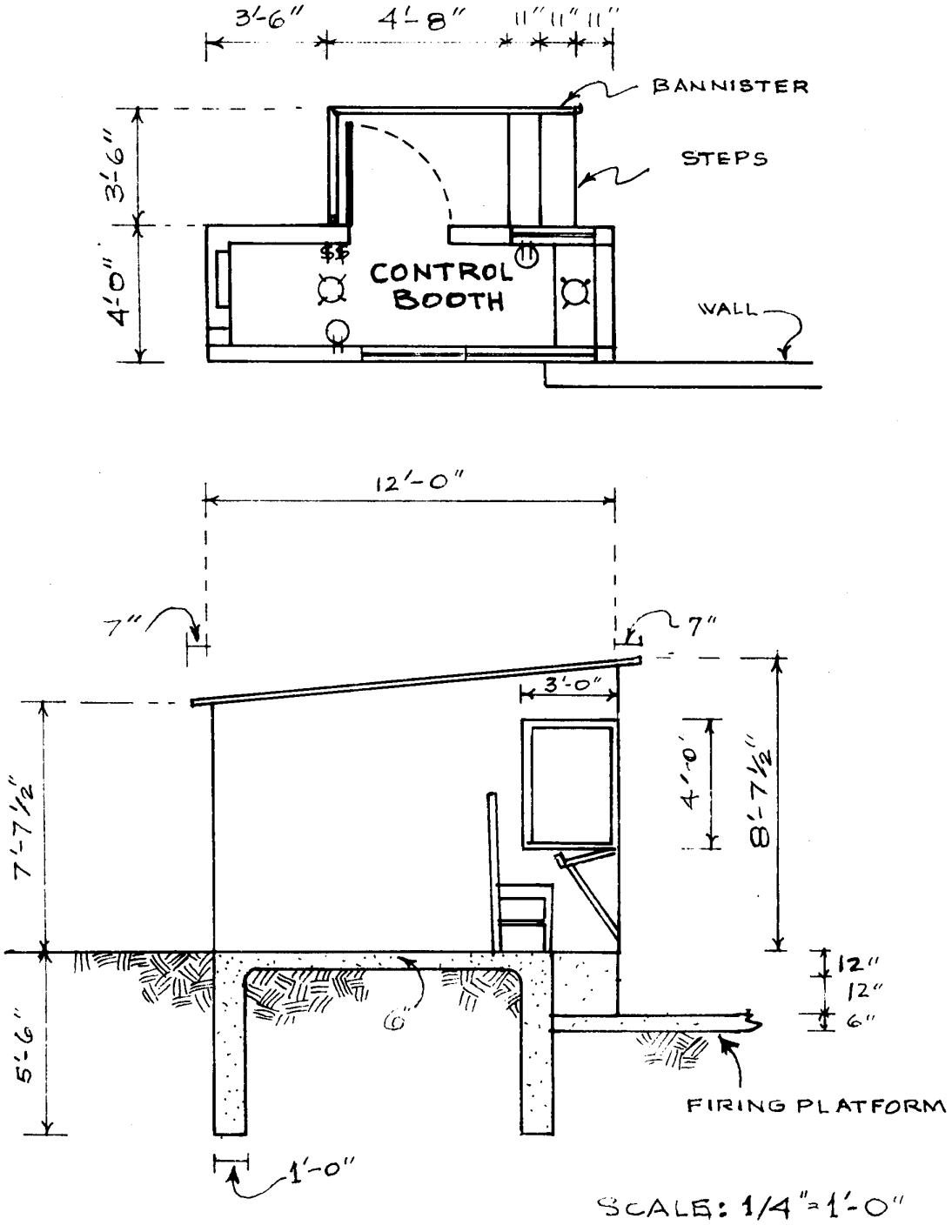
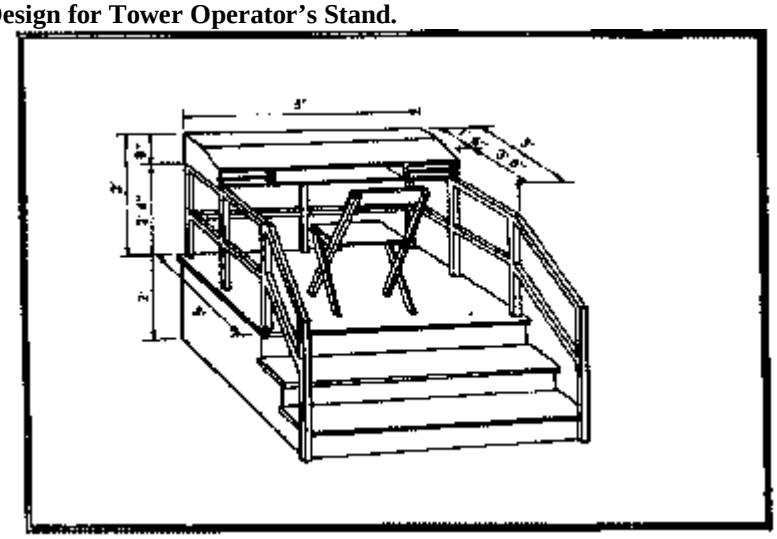


Figure 3.6. Suggested Design for Tower Operator's Stand.



NOTE: Height of stand varies depending on length of firing line. Stand to be high enough for range officer to see and control entire firing line.

Figure 3.7. Details of Tower Operator's Chair.

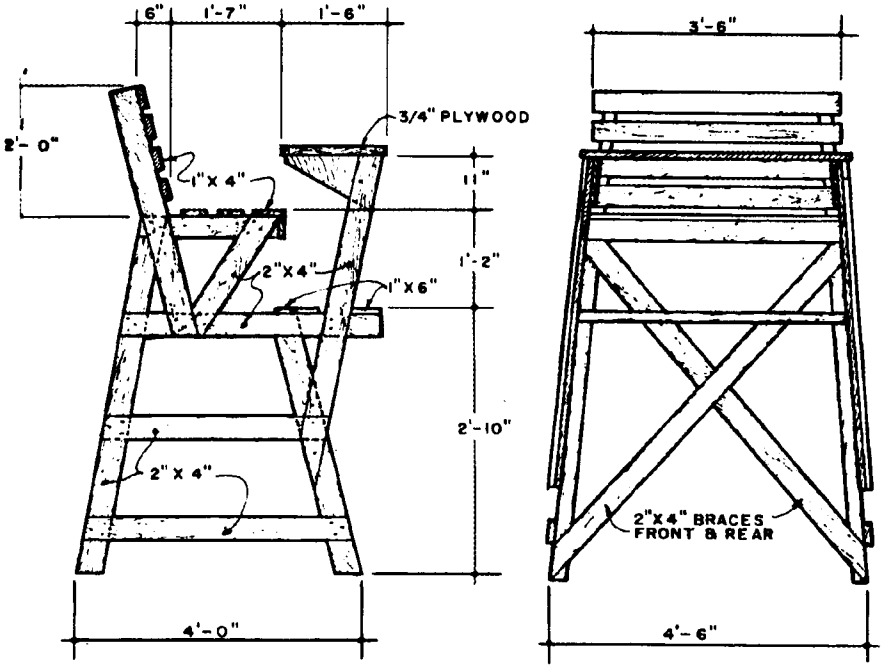


Figure 3.8. Impact Range Control Tower.

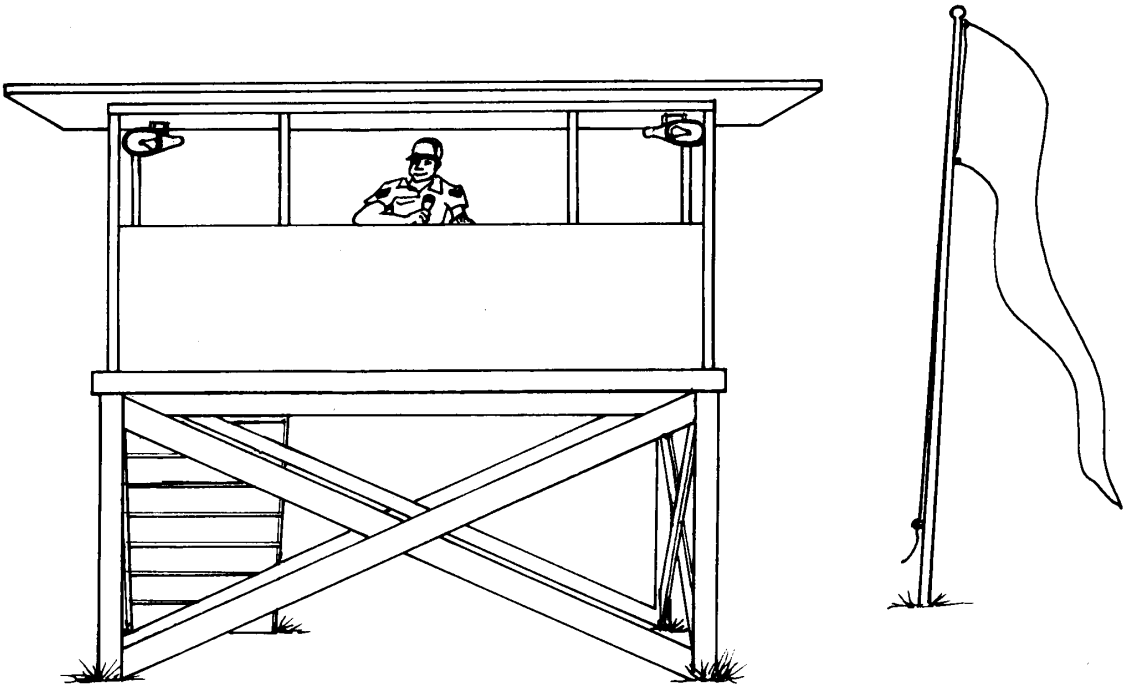


Figure 3.9. Surface Danger Zone for Ranges With Target Area Width Same as Firing Line Width.

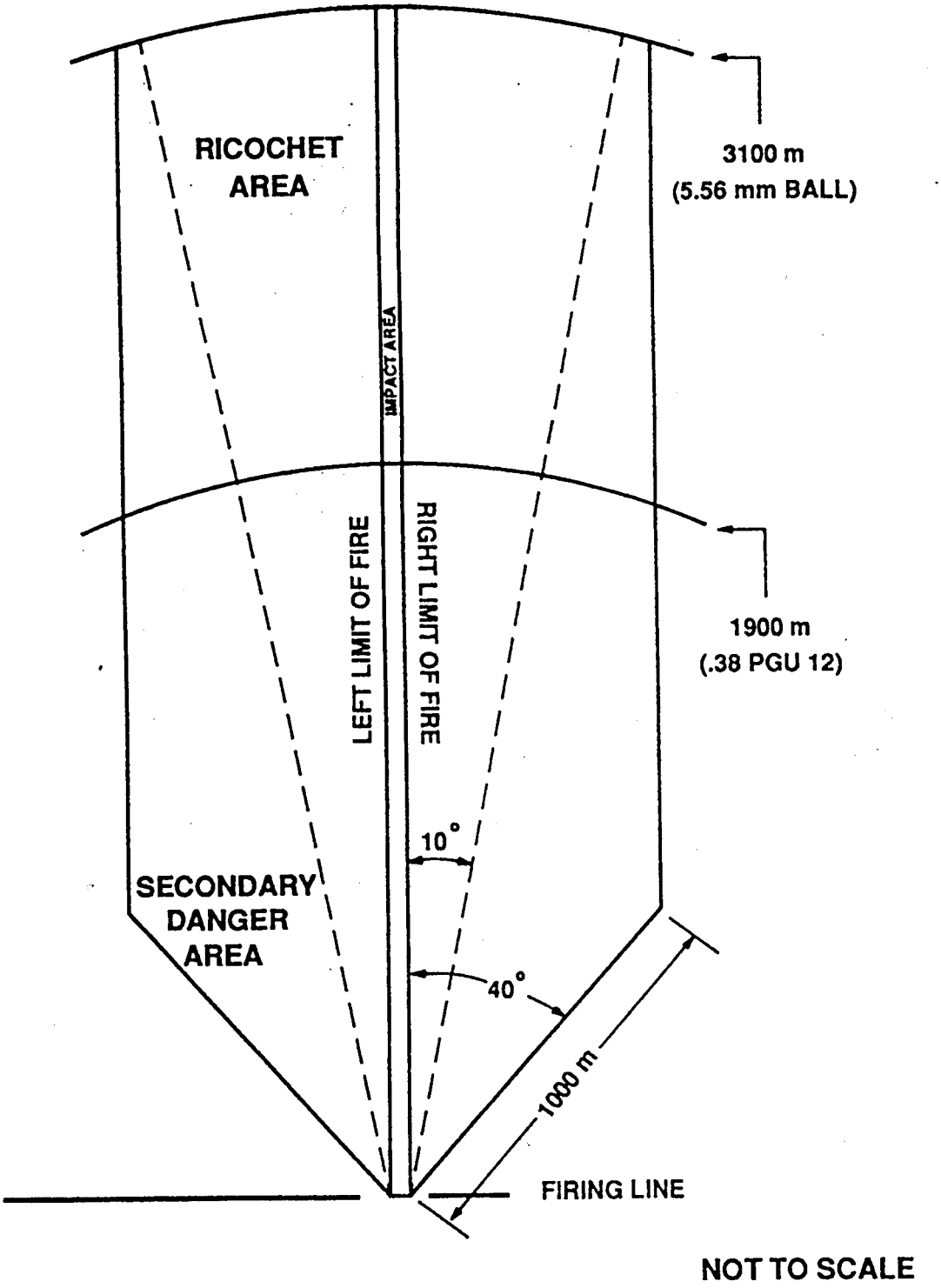


Figure 3.10. Surface Danger Zone for Ranges With Target Area Wider Than Firing Line Width.

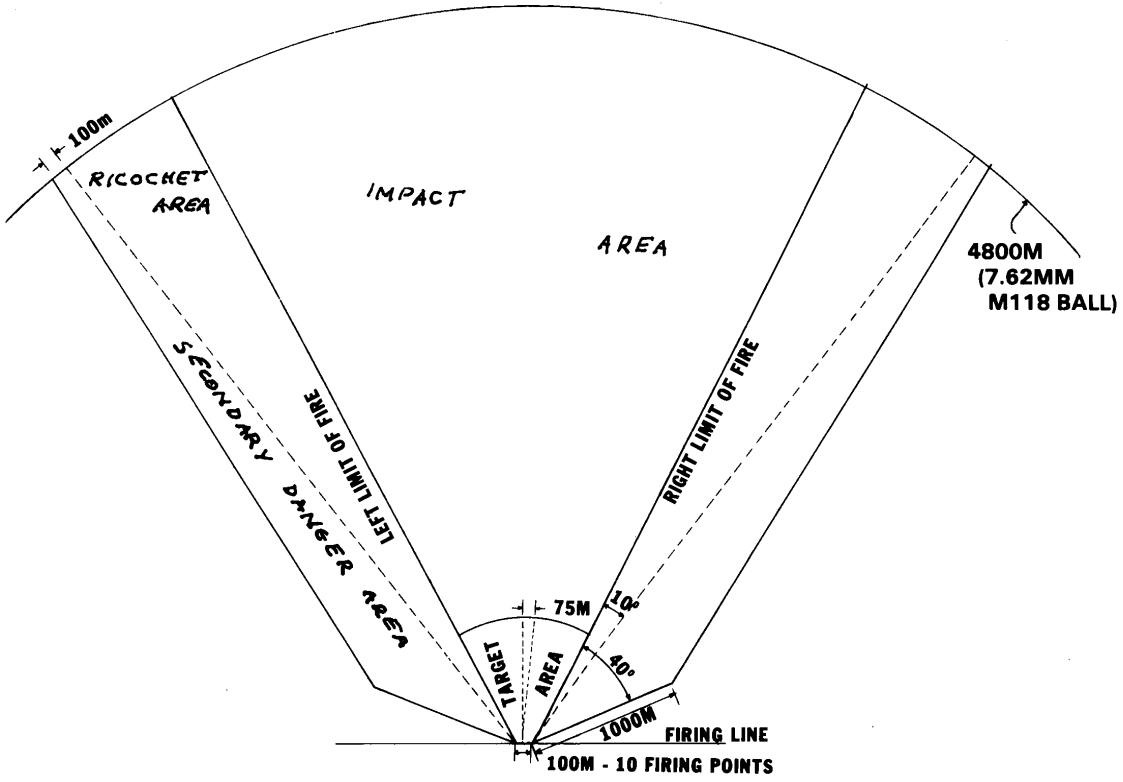
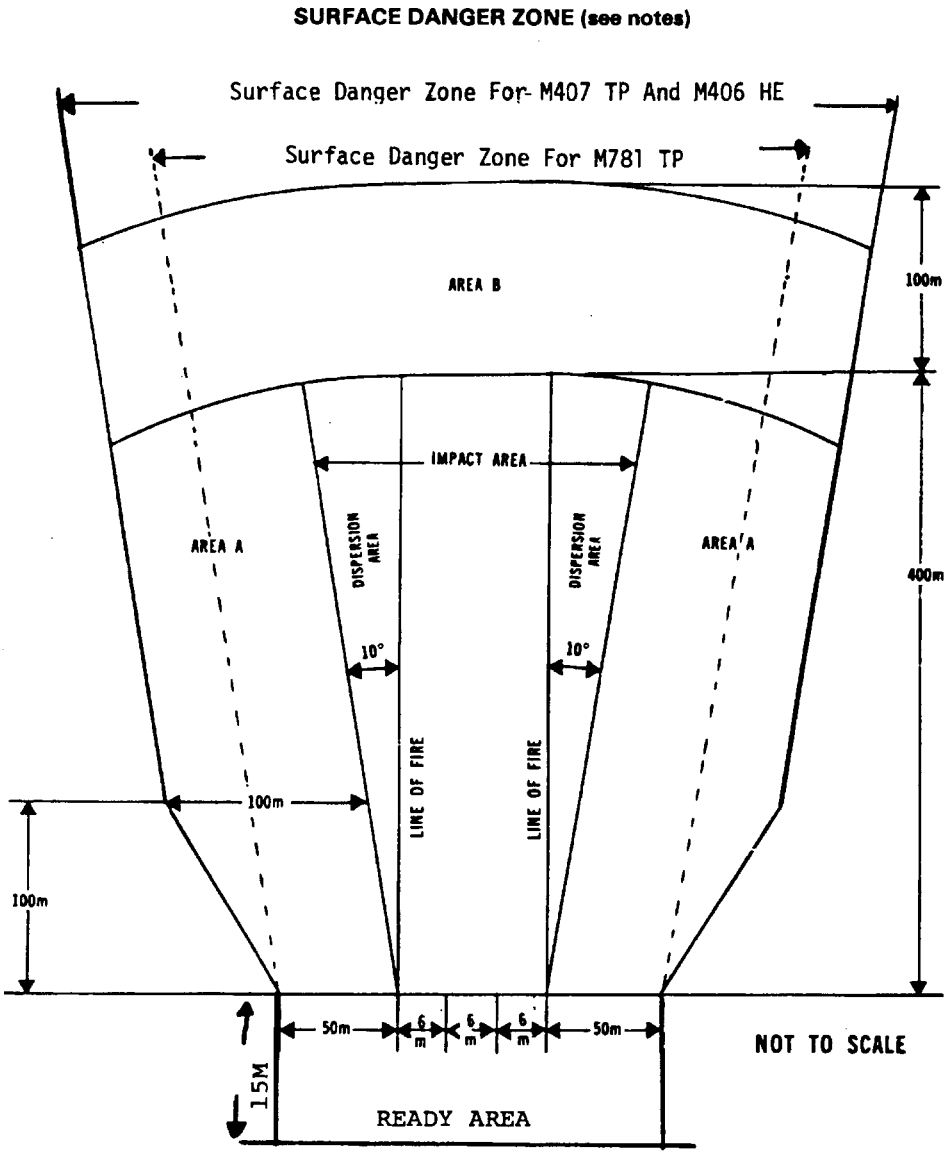


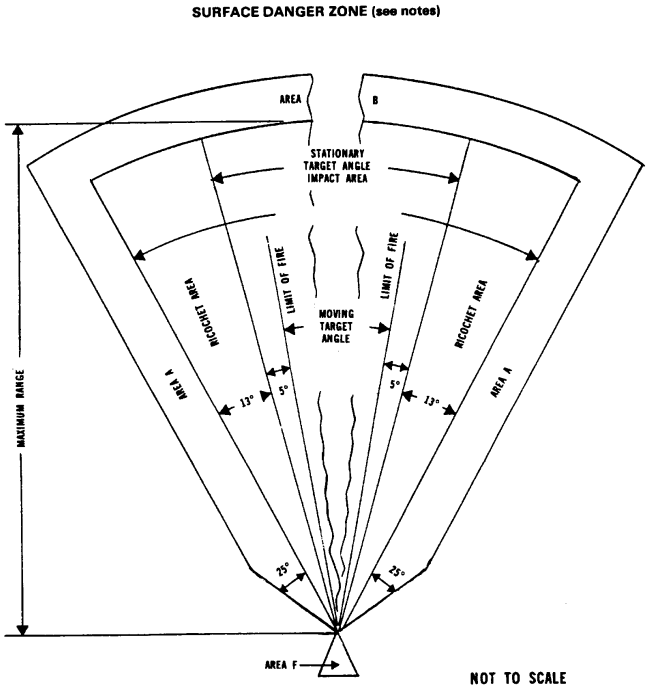
Figure 3.11. Surface Danger Zone for M79 and M203 40mm Grenade Launcher Ranges.



NOTES:

1. Additional firing positions may be added provided minimum separation of 6 meters is maintained.
2. Provide a 100-meter clear zone (areas A and B) around the perimeter of the range for EOD disposal of dud rounds (M407 TP and M406 HE). A 50-meter clear zone may be used if only M781 TP is used on the range. Refer to TO 60D-2-2-23 and EOD personnel for disposal procedures and requirements.

Figure 3.12. Surface Danger Zone for Light Antitank Weapons Ranges.



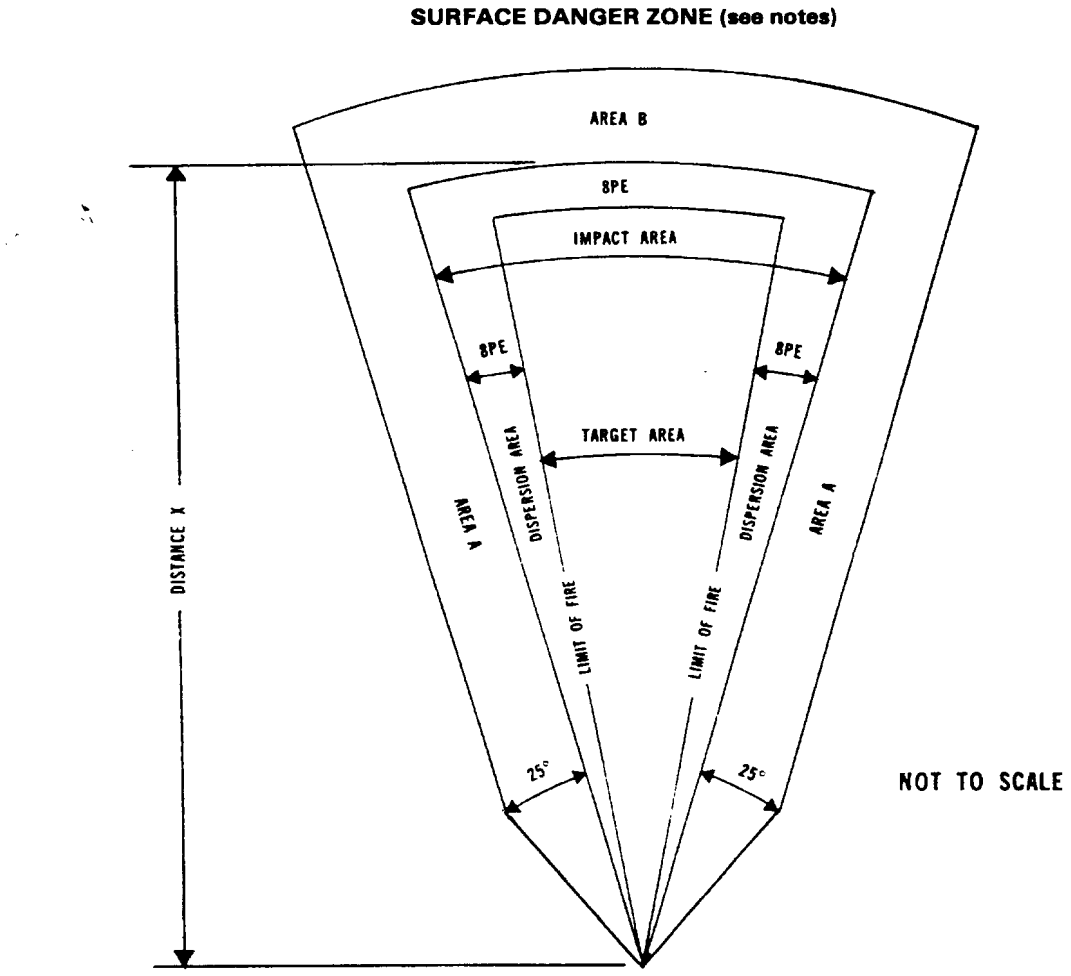
NOTES:

1. This surface dange zone applies to the 35mm M73 practice rocket and the 66mm M72 LAW rocket.
2. The danger zone to the rear of the launcher (area F) is an isosceles triange with apex at the breech and the width of triangle corresponding with rearward extension of line of fire. Base and depth of triangle are shown below.

Dimensions of areas in meters

	Area		Minimum range	Maximum	Area F	
Caliber	A	B	to impact	range	Depth	Base
66mm heat rocket M72	250	250	75	1000	40	25
35mm subcaliber Practice rocket M73	100	100	50	1200	40	25

Figure 3.13. Surface Danger Zone for 81mm Mortar Ranges.



For mortars firing at terrestrial targets.

Distance x must not be less than the maximum range for the greatest charge to be used.

	Dimensions of areas in meters (see notes)	
Caliber	A	B
81mm.....	350	400

NOTES:

1. The quadrant elevation limits must be modified to take into account the distance to the minimum and maximum limits of the impact area. Before registration, the target must be selected in the central portion of the impact area. After registration, registration corrections must be applied to deflection and quadrant elevation limits.
2. Dimensions of areas A and B may be reduced by 50 percent when firing illumination cartridges.

Figure 3.14. Surface Danger Zone for Ranges With Target Area Width Same as Firing Line Width.

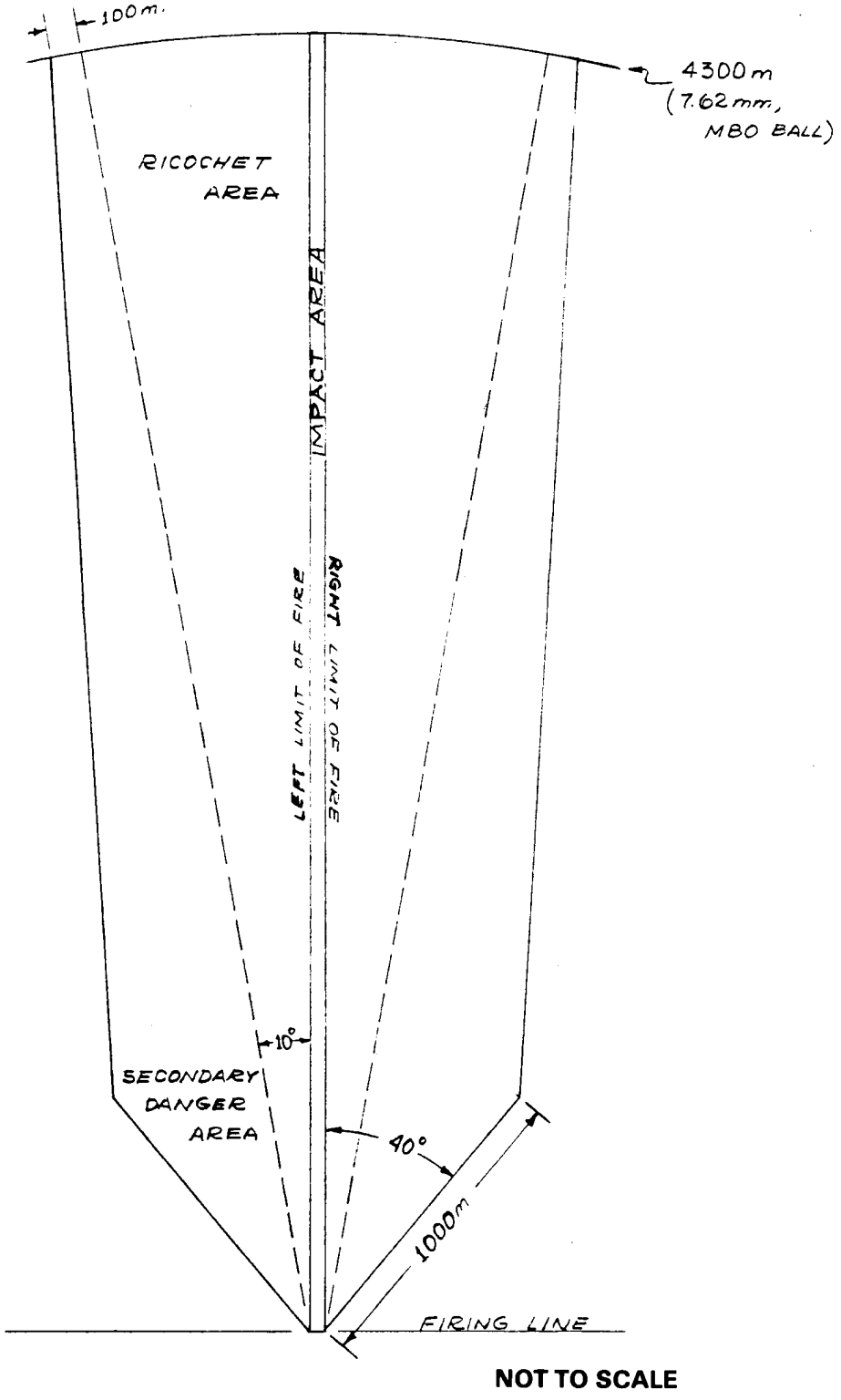


Figure 3.15. Sample Vertical Danger Zone.

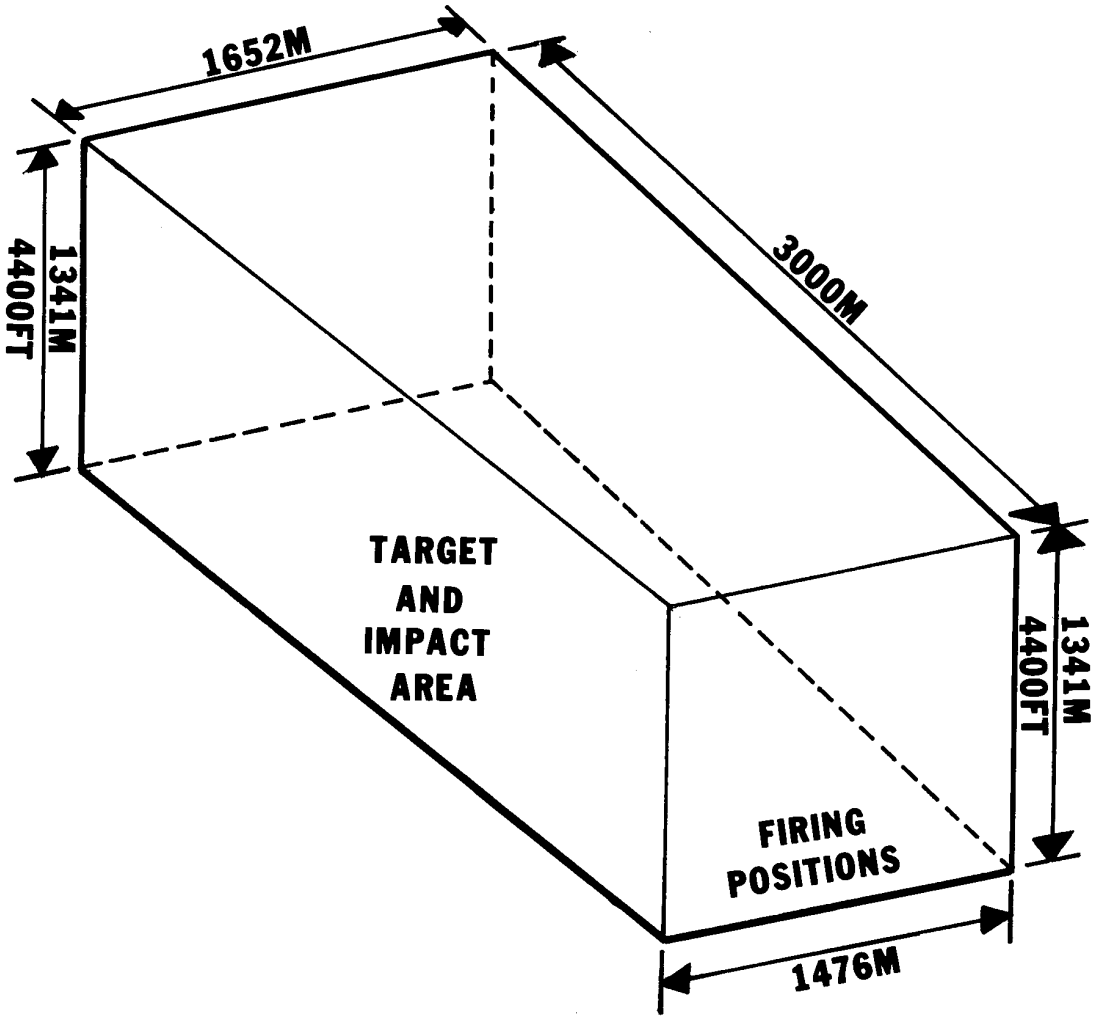


Figure 3.16. Combat Arms Training and Maintenance (CATM) Building.

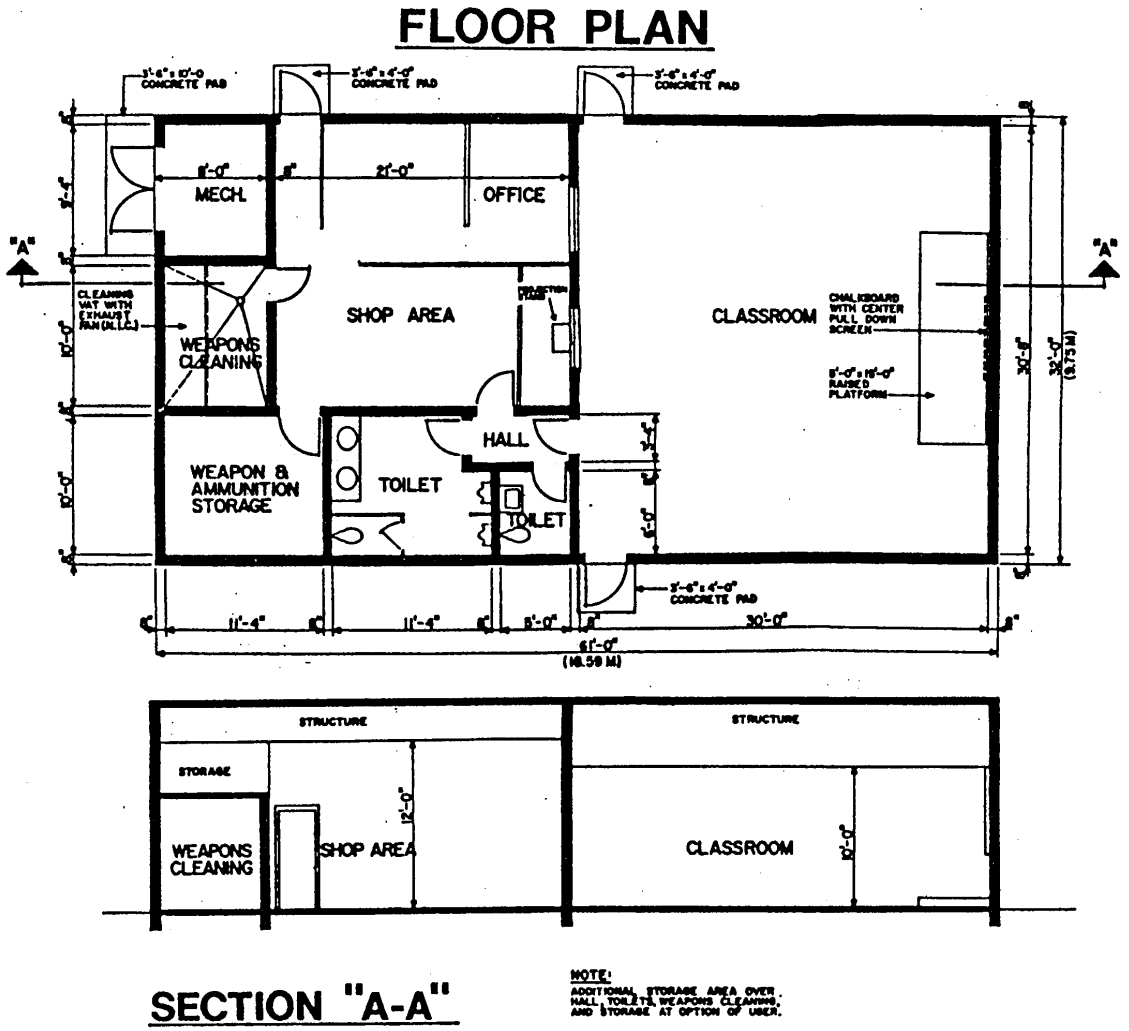


Figure 3.17. Range Test Screen.

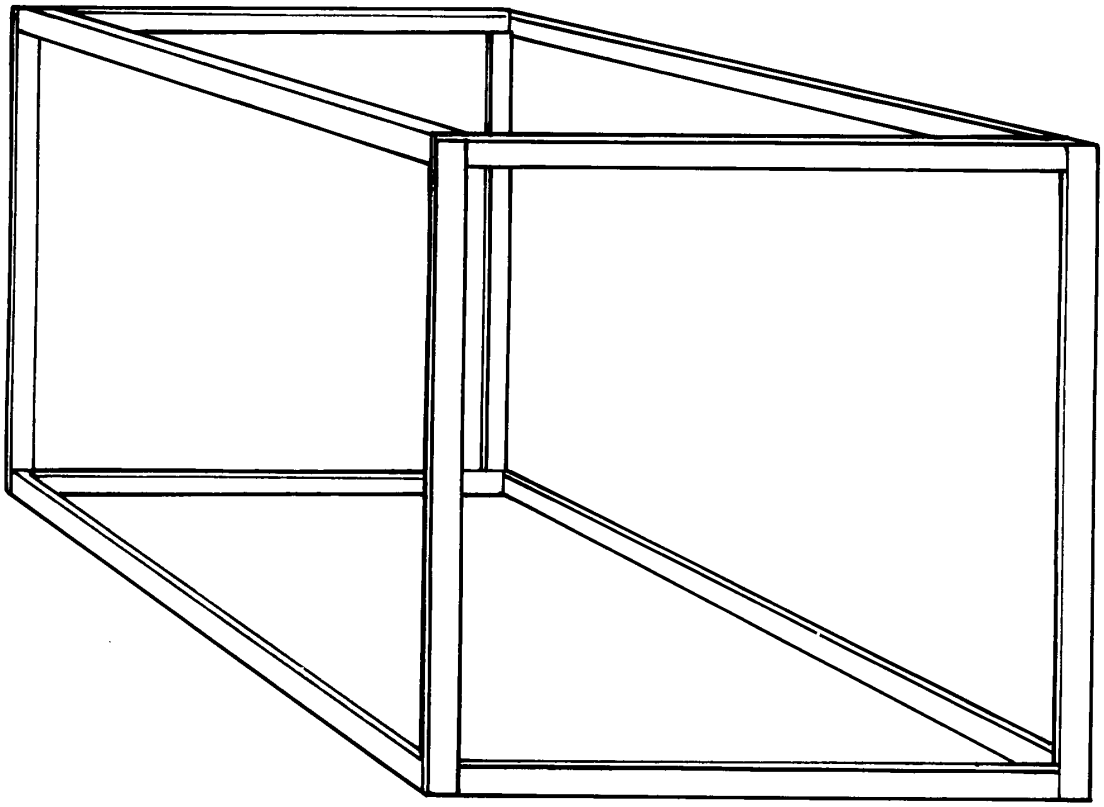


Figure 3.18. Test Firing Using Test Screen.

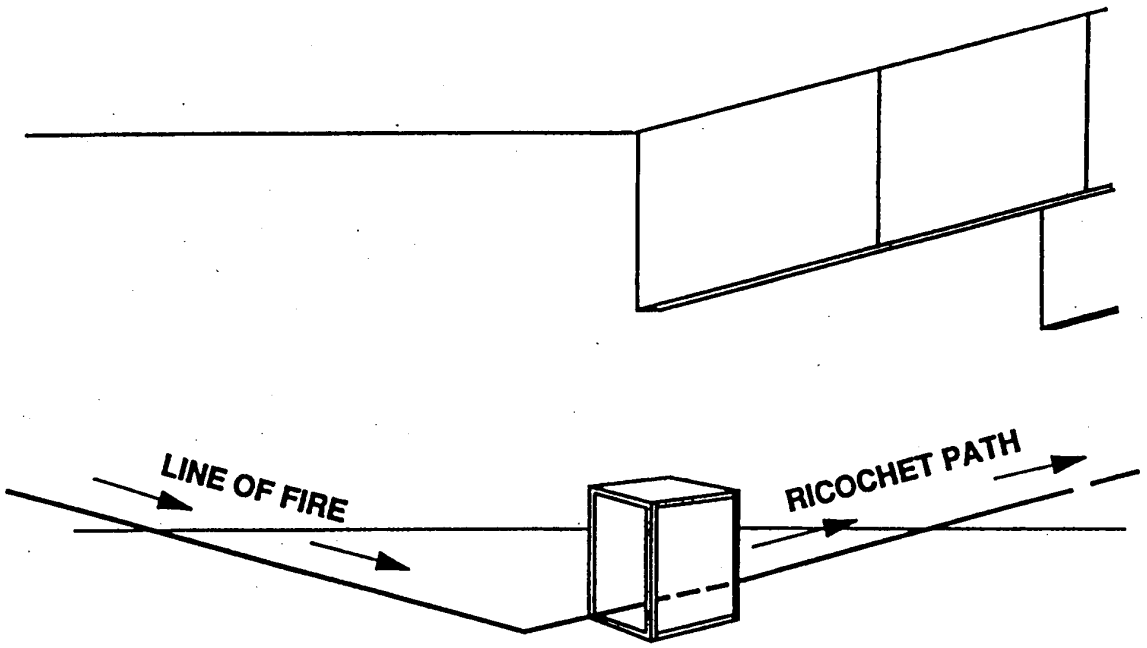


Figure 3.19. M60 Machine Gun, 10 Meter, 5-Position, Tube Range.

A 300 YARD SURFACE DANGER ZONE (SDZ) IS NOT REQUIRED FOR THIS RANGE

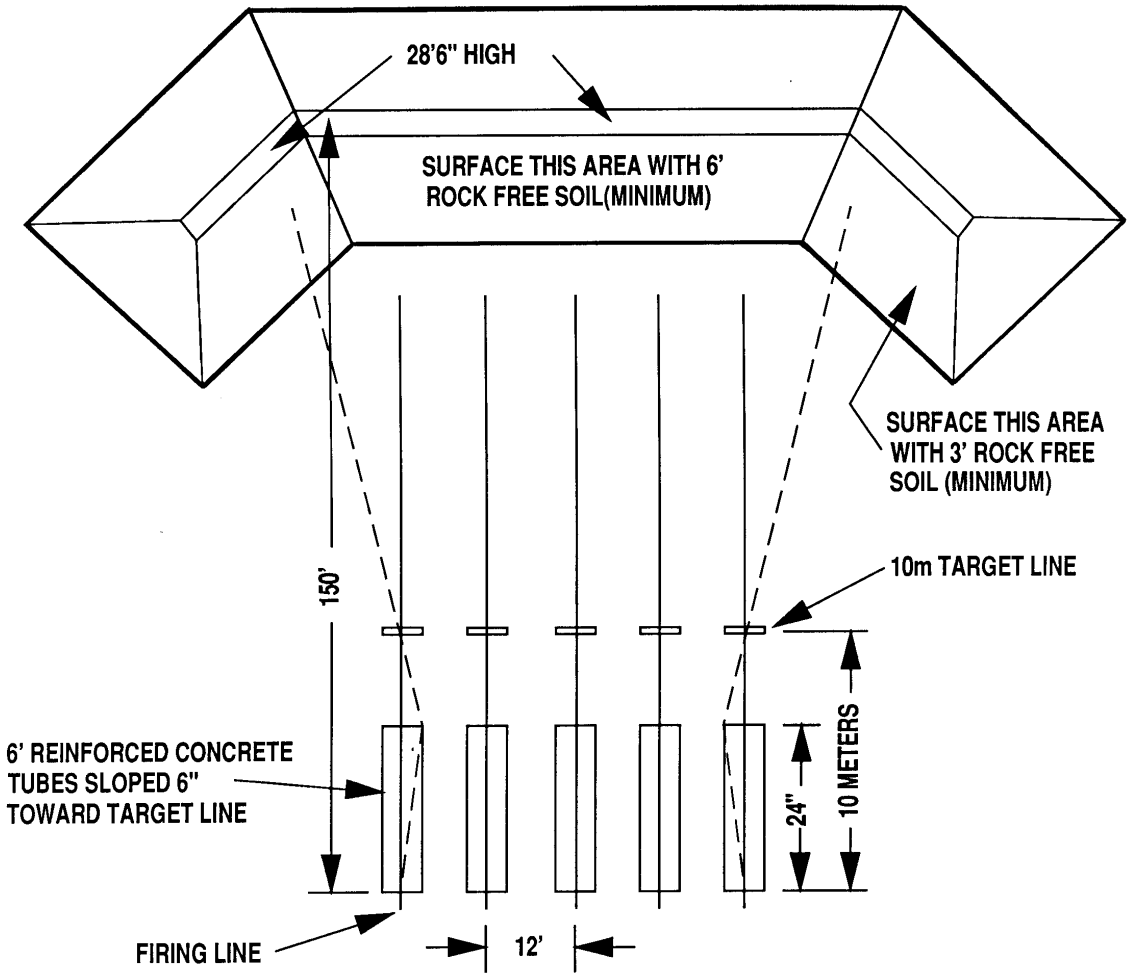


Figure 3.20. M60 Machine Gun, 10 Meter, Tube Range.

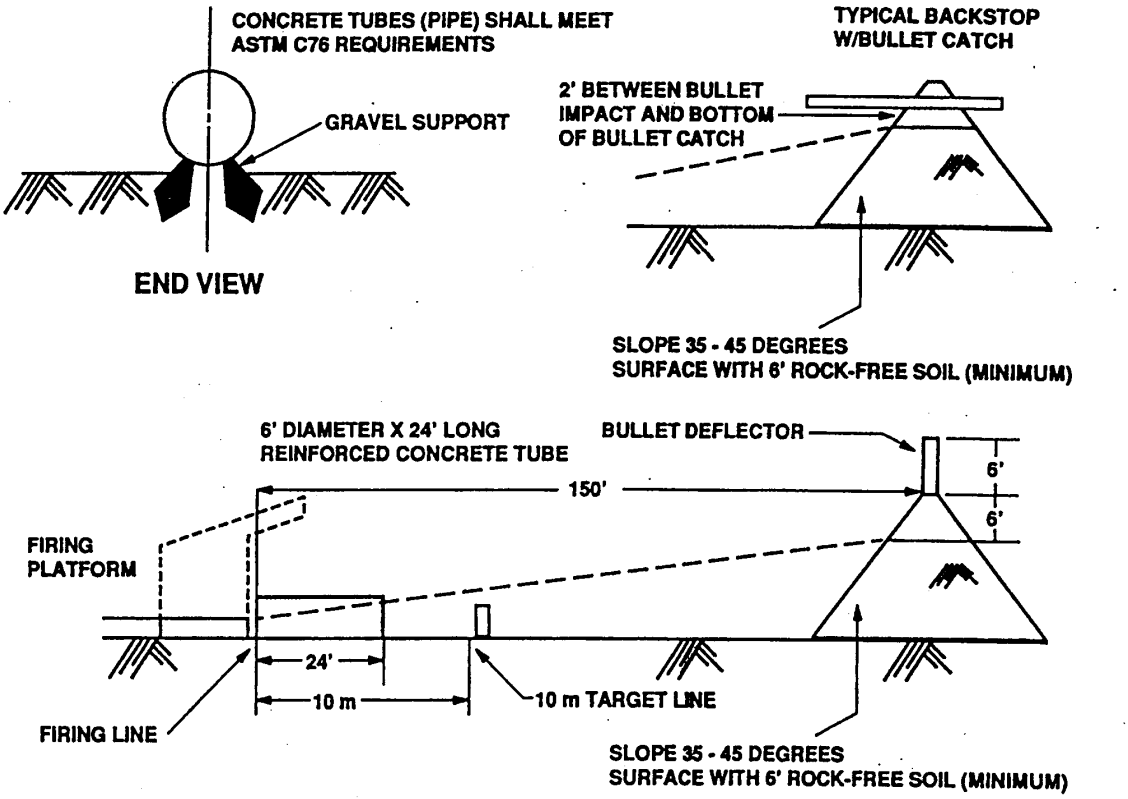


Table 3.1. Ground Weapons Ballistics and Danger Zone Requirements (Meters) (Sea Level--Standard Day).

NOTE: **Meters to yards conversion** $\frac{100 \text{ Meters}}{.9111} = 109.75 \text{ Yards}$

LINE	Weapon/Ammunition	A	B	C	D	F	G
		Maximum Horizontal Distance			Maximum Vertical Distance		
		Maximum Range of Ammunition	Safety Factor (Area B)	Minimum Horizontal Danger Zone Distance	Maximum Ordinate of Ammunition (@30)	Safety Factor	Minimum Vertical Danger Zone Distance
1	Handguns, Cal 38 PGU 12	1900		1900	500	175	675
2	Handguns, Cal 45 Pistol	1800		1800	400	160	560
3	Cal 45 Submachinegun	1800		1800	400	160	560
4	Handgun, 9mm (ball, Parabellum)	1800		1800	500	175	675
5	5.56mm Rifle (M193 Ball)	2800		2800	800	220	1020
6	5.56mm Rifle (M855)	3200		3200		900	1120*
7	5.56mm Rifle (M862)	250		250			
8	Cal 22 Long Rifle	1600		1600	500	175	675
9	12 Gauge ("00" Buck)	600		600	200	130	330
10	40mm (M79 & M203)	500	100	600	100	115	215
11	40mm (MK19) (Improved M430	2300	350	2650	500	175	675
12	7.62mm Rifle & Machinegun (M80 ball)	4300		4300	1100	265	1365
13	7.62mm Rifle & Machinegun (M118 Ball)	4600		4800	1200	260	1480
14	LAW (M72 35mm Subcaliber)	1200	100	1300	300	145	445
15	LAW (M72 66mm RKT Heat)	1000	250	1250	200	280	480
16	AT4 (M136)	2400	488*	2588*			
17	Cal 50 Machinegun (M2 & (M33 Ball)	6700		6700	1600	340	1940
18	81mm Mortar (III: M374A3)	5000	400	5400	2100		
19	81mm Mortar (M880)	490	400	890*			

* Estimated Distances

Chapter 4

RANGE OPERATION AND MANAGEMENT

4.1. Purpose. Provides guidance for efficient management and safe operations of Air Force ground weapons ranges. Sets procedures for conducting training, performing inspections and maintenance on Air Force firing ranges.

4.2. The CATM Section. Implements weapons training through the qualification programs and provides the ground weapons inspection and maintenance program. The following paragraphs will aid in operation and administration of the CATM section. In some cases, this is an expansion of responsibilities listed for the CATM section organizational commander and the CATM superintendent or NCOIC in AFI 36-2226, Chapter 1.

4.2.1. **Administration.** CATM sections will enforce accurate and timely management of their administrative functions to accomplish their mission and upgrade personnel.

4.2.2. **Reference Library.** CATM sections will keep a reference library (see attachment 2) and copies of locally produced supplements and Operating Instructions (OIs). CATM sections must maintain publications listed for those weapons, munitions, and related equipment that they do inspections, maintenance, and training.

4.2.3. **Forms Management and Recordkeeping.** Maintain all files and records according to AFI 37-123, and dispose of according to AFI 37-133, Volume 2, *Disposition of Air Force Records--Records Disposition Schedule*. Order and maintain forms according to AFI 37-161, *Distribution Management*.

4.2.3.1. Maintain records to provide for auditable accounting of all munition items from the time they are drawn from supply and expended on the range or returned to supply (AFMAN 23-110, Volume 1). Dispose of the records according to AFI 37-133, Volume 2.

4.2.3.2. Maintain records on the disposition of ammunition residue (fired brass, etc.). Dispose of recoverable and nonrecoverable residue as directed by AFMAN 23-110, Volume I and AFI 23-102, *Air Force Recoverables*.

4.2.3.3. Maintain a record of maintenance performed on each weapon repaired.

4.2.4. **Budget Requirements.** Prepare and submit the budget not later than 15 months before the date of the budget or as required by local comptroller policy.

4.2.5. **Supply and Equipment Procedures.** The CATM superintendent or NCOIC will ensure adequate quantities of weapons, ammunition, targets, spare parts, tools, and other items needed for the CATM section mission are on hand. TAs 006, 016, 538, and 629, and appropriate T.O.s provide authorizations.

4.2.5.1. **Ammunition Authorizations.** AFCAT 21-209 provides specific ammunition allowance authorization and quantities authorized for expenditures in support of the CATM mission.

4.2.5.2. **Target Procurement and Repair.** Targets for weapons training may be procured through normal supply channels. Targets of the correct type and quantity are needed to meet annual qualification firing requirements. Target repair and maintenance is a divided responsibility. Range personnel are responsible for daily maintenance, such as replacing target frames and resurfacing frames or target backers. The BCE provides materials and assists in constructing target frames.

4.2.5.3. **Equipment Accountability.** The CATM account custodian will maintain a list or machine listing of accountable equipment items. This equipment includes office equipment and furniture, hand tools, special tools for weapons, and all weapons.

4.2.5.4. **Consumable Supplies.** Establish local procedures to ensure adequate quantities of consumable supplies are maintained. These include office supplies (such as pencils, paper, and pens); lumber for target frames; nails, nuts, bolts, screws; paint, solvents, bore cleaner; weapons cleaning supplies, bore brushes, patches; targets and target material; fertilizer, and so forth.

4.2.6. **Operating Instructions (OI).** As necessary, each individual CATM section will develop and maintain CATM OIs. Coordinate OIs requiring approved waivers for implementation according to AFI 36-2226.

4.2.7. **Lesson Plans.** Maintain a master copy of all lesson plans in the CATM office. The superintendent or NCOIC will review the masters and all copies of each weapon lesson plan at least annually. The superintendent or NCOIC will certify the lesson plan's currency by dating and signing an AF Form 3126, **General Purpose**, (See figure 4.1) or approved MAJCOM lesson plan review form. Review and certify lesson plans when there are T.O.s or regulation changes. Complete an AF Form 3126 as shown in figure 4.1 or MAJCOM lesson plan review form and attach one to each master lesson plan. Overprint of major headings on this form is authorized.

4.2.8. **Training Schedules.** Develop weapons training schedules that ensure maximum use of CATM facilities. CATM sections will request an annual training forecast from each supported unit. This forecast will identify the number of personnel requiring weapons qualification, type weapon training is required for, type training required,

and the rationale or justification for this training. Unit training sections will schedule their people for the training. When necessary, send "no-show" letters through the CATM section commander to organizational commanders to inform them when training slots are not used. The CATM schedule should also include appropriate allocations of time for weapons inspections and maintenance, range maintenance, and instructor training.

4.3. Range Use:

4.3.1. **Military Use.** Training of military people to meet mission requirements has priority over all other range use. The owning base or installation commander establishes unit training priorities according to each unit's mission requirements. Installation commanders may authorize National Guard units, Reserve components, and other bases or services to use the ranges on an as available basis. Units (security police Peacekeeper teams, CE, etc.) using the range without host CATM personnel assistance must provide qualified range personnel who have been briefed by the host CATM superintendent or NCOIC on local range policies and procedures.

4.3.1.1 **Host-Tenant Agreements (Training Support).** Tenant units will request weapons training and maintenance through the host-base CATM section. Formalize this training through an agreement according to AFR 11-4, *Host-Tenant Support Responsibilities of USAF Organizations*. Tenant units are scheduled for training using the same priority basis as host-base units.

4.3.2. **Official Nonmilitary Use.** The CATM section commander may authorize range use for recreational shooting activities including the firing of privately owned firearms, providing such use does not interfere with the CATM section's mission. When firing is being done on Air Force ranges for recreational purposes, no less than two people must be present. At least one of the individuals present must have been briefed by the CATM superintendent or NCOIC on range safety and operation policies and procedures and possess written certification thereof. The other person must be capable of summoning assistance, if needed. Firearms that are fired on Air Force ranges must not exceed range limitations, and the owner must ensure the weapon is serviceable and must have approval to fire the weapon on the range. When shooting competitions are conducted on Air Force ranges, instructors, safety personnel, and those managing the event must brief participants on operating procedures, methods, and commands. All personnel including spectators are under the control of the tower operator while on the range complex.

4.3.2.1. Authorized civilian shooting groups may use Air Force ranges during those times when the ranges are not required for Air Force or other military needs. The CATM section and unit commander approves range use by civilian individuals or organizations.

4.3.3. **Recreational Use-of-Range Property:**

4.3.3.1. Air Force installations with large range areas may permit hunting, fishing, picnicking, or other recreational activities. Recreational activities must not conflict with weapons training requirements.

4.3.3.2. Personnel, both military and civilian, must first demonstrate their firearms safety, proficiency, and knowledge to designated officials before they are allowed to use the range area for hunting. Local requirements dictate the content and scope of examinations for hunters; however, a hunter safety course should be included in each examination. In determining standards and restrictions for the course, range officials must coordinate with ground safety personnel. Safety officials assist with local requirements for range usage as outlined in AFI 32-7009, *National Resources--Fish and Wildlife Management*.

4.3.3.3. When the range area is used for recreational purposes, post in the installation base bulletin once a week the date and hours recreational use is permitted. After the recreational season is over, return the range area to a no-trespass basis and place this information in the base bulletin for several weeks.

4.4. Range Safety. Listed below are the minimum items and information necessary for safe range operation. Local conditions may require additional safety precautions.

4.4.1. **Trespass Notices.** Semiannually, place legal notices to the public in the base bulletin and newspapers. Place similar notices in local area newspapers if the base is considered an open installation, or all or part of the range impact area lies outside secured base perimeters. In such notices, give the location of the range or ranges, and state that trespassing is not only illegal but also dangerous because of gunfire. Include in the notice-the-office address, personnel to contact, and phone numbers to call in case there is a valid need for entry. Notices are not required at overseas locations where tensions are high and the local threat would indicate such notices may bring undue attention to the base.

4.4.2**. Warning Signs.** Place signs along the normal boundaries of the range. Signs will be white background with red letters. Wording on the signs should be similar to figure 3.2. Post the signs no further than 150 meters apart along range perimeters parallel to roads or paths. Place signs close enough to give reasonable and proper warning along other areas of the SDZ. Local conditions govern the placing of these signs. Signs will be bilingual where English is not the national language, or multilingual where needed. Post bilingual signs on continental United States (CONUS) ranges located near foreign borders. Local policies will determine this requirement.

4.4.3. **Road Guards.** On some ranges, during the firing of certain types of weapons, road guards may be necessary to prevent entry into the danger area until daily firing is

completed. Post signs and range flags showing the proper approach to a firing range and to give adequate warning to personnel approaching in vehicles. Roads entering the SDZ that do not have fences, gates, or adequate barriers to prevent vehicles from trespassing must have road guards posted. Post road guards along frequently traveled trails or footpaths, at places where children might trespass into range danger areas, and where adequate fences or barriers do not exist. When special traffic problems exist, use road guards to direct traffic to such places as special parking areas or over designated routes.

4.4.4. **Range Communications.** Before daily firing, check the telephone system or radio that links the range with the parent installation to determine if it is serviceable.

4.4.5. **Posting of Range Safety Rules.** Post a sign or signs in an appropriate area to the rear of the range in a location where all who enter the range may read the rules for safety while on the range. The sign will include, but is not limited to, the following:

- Treat all weapons as if they are loaded.
- Holster and secure all weapons when they are not in use, or have the actions open, or the cylinders swung open.
- Keep the muzzle of the weapon under control at all times.
- Do not point the weapon at anything you do not intend to shoot.
- Avoid all horseplay while on the range or while handling weapons.
- Do not handle any weapon until told to do so by proper range officials.

4.4.6. **Display of Flag and Streamers.** Display a red streamer (at least 4 feet by 9 feet) or a rotating red beacon at each range complex entry point. This streamer or beacon indicates the range complex is in operation and firing is scheduled. Streamers may be ordered or locally manufactured. Flagstaffs used to display the streamer will be no less than 20 feet in height. Flagstaffs used to display a rotating red beacon should be at a height (depending on local conditions) that allows it to be visible to all personnel approaching the range complex. Each individual range will display an additional red flag (at least 2 feet by 3 feet) while the range is in operation. The streamer or beacon at the point of entry will be sufficient if the streamer or beacon is visible from a superimposed or special range. Completely enclosed indoor ranges with controlled access through secured doors, do not require streamers or beacons. A removable sign at the facility entrance is recommended to caution personnel that firing is in progress.

4.4.7. **Emergency Equipment.** To provide for essential first aid and an immediate means of transportation for an accident victim, a serviceable vehicle (military or civilian) and a first aid kit must be immediately available any time the range is in operation.

4.4.8. **Unsafe Acts and Conditions:**

4.4.8.1. Range personnel have the responsibility to enforce proper safety procedures and practices on firing ranges. They have the prerogative and the duty to remove from the firing line or range any persons who are considered unsafe. Using tact and diplomacy, immediately remove any person or persons from the firing line who repeat infractions, disregard instructions, or flagrantly violate safety practices.

4.4.8.2. Range conditions could constitute safety hazards. Excessive rains may erode berms and backstops so they do not contain bullets; overhead and ground baffles rot or become damaged and no longer stop bullets; and electrical wires become frayed and are no longer properly insulated. If these or similar conditions exist, immediately advise the proper officials so they can take corrective action. Inspect ranges for safety deficiencies before firing each day. If unsafe conditions are discovered, correct them before the start of firing. On impact ranges, check entry points for unauthorized entry and, where possible, visually inspect the impact area before the start of firing to make sure personnel or equipment are not in the impact area. Make sure barriers and fences are in place.

4.4.9. **Safety Equipment.** During live fire training, combat arms instructors will wear hearing protection, eye protection, and a red baseball type cap with the words COMBAT ARMS embossed with 1-inch black letters.

4.5. Daily Range Opening and Closing Procedures:

4.5.1. **Daily Opening Procedures.** The CATM superintendent, NCOIC, or the senior range representative will make sure all firearms, ammunition, and equipment needed to support that day's operation are in place before the arrival of the students; make sure the range is inspected (see paragraph 4.7); make sure the equipment is serviceable and ready for use; make sure the range flag is raised or the beacon turned on before any weapon firing; and select a lead instructor for each training session.

4.5.2. **Daily Closing Procedures.** When closing the range after each day's operation, make sure the range and range facilities are ready for the next day's operation; make sure all equipment is accounted for; make sure range flags are lowered and stored and the beacon turned off; and make sure all facilities are properly secured.

4.6. Firing Procedures. Before firing begins, the tower operator must brief all personnel scheduled to fire a course or phase of fire. This short briefing should include, but is not limited to, course of fire, positions to be used, time limits, and so forth. Include safety in the briefing, emphasizing the procedures in this regulation, plus any general or special instructions applicable to a specific range.

4.6.1. **Ready Line.** The ready line is immediately behind the firing line. Shooters remain behind the ready line and assigned firing positions until they are given further

instructions. The tower operator notifies the shooters when to proceed from the ready line to the firing line.

4.6.2. **Firing Line.** This is the line where the shooter occupies a predetermined position and fires a course or order of fire. The firing line is occupied only on the tower operator's command. Range personnel must observe all personnel approaching, occupying, or departing the firing line as this is one of the times when a breach of safety is likely to occur. Transport all weapons to and from the firing line with the actions open, slides locked opened, cylinders open, or the weapons holstered and secured. Ground weapons at the firing positions with the actions open and muzzles pointed downrange. Handguns will be holstered and secured. Shooters will handle the weapons only on the tower operator's command. Do not permit anyone forward of the firing line until the line is cleared. "Cleared" means all weapons grounded with actions open, safeties on, or holstered and secured, and visually inspected for safe conditions by range personnel. During orders of fire, range personnel must make sure no one assumes a firing position in front of the firing line and all shooters are aligned. Allow only shooters and range personnel on the firing line during orders of fire. Authorization may be given to coaches to occupy the firing line during special events or training, as required.

4.6.3. **Target Scoring.** Firing ranges have two types of scoring--scoring for qualification and scoring for competition. The qualification course of fire trains people to fire from various positions at assorted targets. The total score measures the trainee's accuracy with a weapon. Score competitions as prescribed by the governing body of the competition, such as the National Rifle Association or International Shooting Union.

4.6.4. **Range Commands.** Range commands listed on this page are the minimum for conducting courses of fire. Additional or substitute commands may be given when they do not violate safety rules or cause safety hazards. CLEAR THE RANGE! IS THE RANGE CLEAR? CLEAR RIGHT? CLEAR LEFT? THE RANGE IS CLEAR! SHOOTERS MOVE FORWARD TO THE _____POSITION! YOU MAY HANDLE YOUR WEAPONS! SHOOTERS, THIS ORDER OF FIRE IS _____, YOU WILL FIRE _____ ROUNDS IN _____ SECONDS OR MINUTES! WITH _____ ROUNDS LOAD! It may be necessary to repeat orders of fire, positions, number of rounds, and time limits to ensure all shooters understand the orders of fire. IS THE LINE READY? THE LINE IS READY! NOT READY! FIRE! CEASE FIRE! ARE THERE ANY ALIBIS! ALIBI FIRE! CEASE FIRE! CLEAR, GROUND, OR HOLSTER AND SECURE ALL WEAPONS! MAKE THE LINE SAFE! IS THE LINE SAFE? SAFE RIGHT? SAFE LEFT? THE LINE IS SAFE! GO FORWARD --SCORE/REPAIR/CHANGE TARGETS Examples of additional commands: IS THE LINE READY? READY ON THE RIGHT? READY ON THE LEFT? READY ON THE FIR-ING LINE! THE LINE IS READY! COMMENCE! ..FIRE!

4.6.5. **Cease-Fire Commands.** The tower operator conducting range firing usually gives the command, "Cease fire!" and follows it with the command, "Make the line safe!" If there is an emergency, such as an accident or an unsafe condition, anyone who sees it, whether it be range personnel, shooter, or spectator, immediately commands "Cease fire!" in a loud, clear voice. The tower operator then commands "Make the line safe!" Regardless of who gives the cease fire command, all shooters must cease firing immediately. After range personnel correct the condition that caused the emergency, firing may resume.

4.7. Range Safety Inspections. The CATM section will inspect ranges and other facilities to make sure maintenance and safety requirements are met. During range inspections, ensure all potential problem areas are identified for maintenance. Minor shot damage, erosion, peeling paint, etc, may become serious problems if not repaired early.

4.7.1. The CATM section will inspect the range each day before the start of firing and when firing is completed.

4.7.2. Schedule other inspections to coincide with programmed range inspections such as quarterly self-inspections. Document range condition and list maintenance needed.

4.7.3. A CATM section representative will go with the base safety officials during range inspections. A CE representative may also accompany them during the inspection. The safety official prepares the inspection report and provides a copy to the CATM section. The CATM section ensures corrective actions are taken to ensure safe range operation.

4.7.4. As a minimum, inspect the items listed below. MAJCOM and local CATM officials may add inspection requirements as necessary to meet their particular situation.

4.7.4.1. **Backstop Condition.** Inspect backstops to make sure it meets criteria in paragraph 3.5.7.1. Check for erosion both in back of the targets and at all points that face the shooters. Heavy lead buildup, which could cause ricochets, can occur in the impact area of the backstop. To test for excessive leading of the backstop, rod the suspected area using a 3/8-inch diameter rod with a 3-foot mark. Tap the rod into the backstop using a 4-pound (maximum) hammer. The rod should pass unimpeded through the 3-foot layer of topsoil. To verify whether range conditions are causing a ricochet hazard, the superintendent or NCOIC should conduct a ricochet test according to paragraph 3.9.4.

4.7.4.2. **Deterioration of Baffles and Supports.** Baffles must stop fired rounds. Periodically, visually check each baffle to make sure rounds are not passing through them. Baffles not stopping fired rounds can be temporarily

patched until the base CE can repair them. Excessive hits may weaken baffle supports to the extent they may collapse. Make temporary repairs until the BCE can repair or replace them.

4.7.4.3. **Exposed Rocks.** On baffled ranges, remove rocks larger than 3/8 inch in diameter from the range floor, backstop, side berms (from the range floor to the top of the berm) as soon as the rocks are detected. Closely inspect these areas after severe weather. For impact ranges, remove large rocks and boulders that may create hazards to shooters on that range or people on adjacent ranges.

4.7.4.4. **Cracks in Metal Backstops and Support Brackets.** If cracks are detected in metal backstops or their supports, repair the area in question as soon as possible. If there are cupped areas in the backstop, fired bullets could return toward the shooter or be deflected out of the bullet trap. When making repairs, welds are not permitted in the impact area directly behind the target. Welds must be finished and ground to the same angle as the backstop. Constant bullet strikes on a metal backstop may cause fatigue cracks in a backstop's support brackets. When repairing support brackets, do not change the angle of the backstop from that originally designed.

4.7.4.5. **Bullet Traps (Baffled Ranges With Metal Backstops).** Check for excessive load build up in trap area. Cleaning schedule depends on the amount of use but would probably average about one mining per month. Mining of a backstop is the removal of bullet residue (lead and jacket material). Coordinate with the local bioenvironmental engineer services to ensure compliance with federal, state, and local requirements for disposal of hazardous material.

4.8. Range Maintenance. Both the CATM section and CE organization are responsible for upkeep and maintenance of ranges and range facilities. A proactive self-help program will benefit the CATM section in maintaining safe, professional, and well kept facilities.

4.8.1. CATM section upkeep includes, but is not limited to, close-in grass mowing, touch-up painting, minor repair to baffles, and self-help projects. The CATM superintendent or NCOIC should include time for this maintenance in the monthly schedule. CE provides materials to the CATM section for approved minor maintenance and self-help projects.

4.8.2. The BCE provides facility board approved maintenance to ensure continued operation of the range and range facilities. This maintenance includes, but is not limited to, the replacement of eroding earth, mowing of large grass areas on the range complex, repair or replacement of baffles and baffle supports, and emergency maintenance. The CE scheduling office and the CATM section will jointly schedule required range maintenance. The need to delead and resurface dirt backstops and sandtraps; replace or overhaul baffles; surface and repair range roads, parking lots, and range floors; paint range and range facilities; and repair or replace facilities should be identified for inclusion in scheduled maintenance.

4.8.3. **Mining of Backstops.** The BCE accomplishes or contracts the accomplishment of backstop mining.

4.9. Range Closures. When a range will be closed for more than 60 days, the CATM section commander must notify the MAJCOM CATM program manager by letter or message (during MINIMIZE, use mail). Include the following information.

- Date closed or planned closure date.
- Length of closure.
- Projected reopening date.
- Reason for closure (if possible include costs of repairs).
- Type of training and number of people due training during period of closure.
- Nearest military installation with range facilities.
- Provisions taken to continue training.
- Date and length of time the range was last closed and reason.

Figure 4.1. Lesson Plan Review.

M16 RIFLE LESSON PLAN REVIEW

	DATE REVIEWED	SIGNATURE	DATE REVIEWED	SIGNATURE
MASTER LESSON PLAN	20 MAR 92	John J. Doe	16 FEB 93	Dennis W. Jones
COPY #1	23 MAR 92	John J. Doe	18 FEB 93	Dennis W. Jones
COPY #2	23 MAR 92	John J. Doe	18 FEB 93	Dennis W. Jones
COPY #3	23 MAR 92	John J. Doe	18 FEB 93	Dennis W. Jones
MASTER LESSON PLAN				
COPY #1				
COPY #2				
COPY #3				

AF FORM MAY 83 3126 PREVIOUS EDITION WILL BE USED. GENERAL PURPOSE (8½ x 11")

U.S. G.P.O. 1984-420-979/13524

Chapter 5

WEAPONS MAINTENANCE

5.1. Purpose. This chapter provides guidance on the installation ground weapons inspection and maintenance program. The base CATM section is responsible for the inspection and maintenance of ground weapons assigned to the base and those for which support is required by an approved support agreement. Conduct weapon inspections and repairs as outlined in applicable T.O.s, technical manuals, and field manuals for those weapons.

5.2. Weapon Categories:

5.2.1. **Service Weapons**. Any hand, shoulder, or crew-served weapon generally issued to troops in the field. Crew-served weapons are any ground weapon designed to fire a projectile and normally requiring more than one person to properly operate. In the Air Force, crew-served weapons include M60 machine gun, M2 .50 caliber machine gun, MK 19 40mm machine gun, and mortars. Service weapons are primarily for use in offensive or defensive combat or combat training.

5.2.2. **Match Grade Weapons.** Any hand or shoulder weapon designed, modified, or manufactured chiefly for use in competitive shooting.

5.2.3**. Ceremonial Weapons.** Military weapons used for drill team or honor guard purposes. These weapons may or may not be demilitarized (design altered to prevent live fire use) depending on the need to fire blank ammunition.

5.3. Levels of Maintenance:

5.3.1. **Depot Maintenance.** Maintenance on weapons that need major overhaul (may include complete rebuilding of parts assemblies and end items). This could include parts manufacture, parts and weapon modifications and testing, and parts and weapon reclamation. Usually, depot maintenance is done in support of the Air Force supply system. HQ USAF/LGM has depot maintenance policy responsibility. Air Force Materiel Command (AFMC) and Warner Robins Air Logistics Center (WR-ALC) are supporting agencies. Depot-level maintenance on Air Force weapons is usually done by other services through contracts from WR-ALC. The Air Force Gunsmith Shop at Lackland AFB, Texas, has limited depot maintenance capability.

5.3.2. **Field (Organizational, Direct Support, and General Support) Maintenance.** Maintenance authorized for and done by combat arms specialists and technicians in direct support of using organizations. This maintenance includes all maintenance of ground weapons assigned to the installation. This maintenance is limited to the repair of end items or unserviceable assemblies in support of using organizations on a return to user basis. Installation CATM sections are authorized to perform the following maintenance:

5.3.2.1. **For Ground Weapons Other Than Match Grade.** Inspect and repair within applicable limits of the technical order pertaining to that weapon. The CATM section is authorized to stock weapon spare parts for maintenance levels below depot. The CATM superintendent or NCOIC is responsible for practicing supply discipline. Use historical data, maintenance records, and anticipated mission needs to assist in determining stock levels of weapon replacement parts. Keep in stock at least one of any item for which a maintenance allowance is established and a known requirement exists. Use the total number of "in use" and packaged weapons for which maintenance support is provided to establish spare parts stockage quantities.

5.3.2.2. **For Match Grade Weapons.** Units and individuals possessing match grade weapons needing repair are to ship them to the Air Force Gunsmith Shop. The mailing address is 343 TRS/TTWM, 1520 Service Road, Suite 1, Lackland AFB TX 78236-5722.

5.3.2.3. **For Ceremonial Weapons.** CATM maintenance support is limited to inspections to ensure units are properly maintaining the weapons and replacement of broken parts which prevent proper operation or pose a safety hazard.

5.3.3. **Operator (Individual) Maintenance.** Maintenance individuals and the using organization perform on assigned weapons. This maintenance is limited to authorized disassembly, assembly, cleaning, lubricating, preserving, tightening screws, adjusting sights, and periodic inspections according to applicable T.O.s. Using organizations will not perform other maintenance or stock spare parts to support higher levels of maintenance. T.O.
references to "Organizational Maintenance" refer to Army maintenance levels. In the Air Force, CATM sections perform this level of maintenance.

5.4. Procedures for Maintenance of Unserviceable Weapons. The agency that owns the weapons will take weapons needing repair and AFTO Forms 105 to the base CATM section. CATM personnel will inspect the weapon and determine if they can repair it, or if depot repair is needed. The CATM section must ensure weapons are not returned to depot for repairs which are the CATM section's responsibility. Do not turn in weapons for depot-level maintenance which are awaiting parts nor for cosmetic reasons. If the CATM section is to retain the weapon for repair, issue a receipt to the owning agency.

Notify the owning agency when the weapon is repaired. CATM personnel will place a DD Form 1577-2, **Unserviceable (Reparable) Tag-Material**, on weapons requiring depot repair and return the weapon to the owning organization for turn-in to base supply. Maintain a record of all maintenance performed on weapons. Include type of repair, time required for repair, owning organization, serial number, and type of weapon. Maintain this information in the maintenance shop to provide a historical record of parts used and maintenance performed. Record the maintenance action on the weapon AFTO Form 105 according to T.O. 11W-1-10. Demilitarize or dispose of unserviceable weapons parts according to DOD Directive 4160.21-M-1, *Defense Demilitarization Manual*.

5.5. Inspection of Weapons. Weapons inspections are done to determine weapon serviceability, discover conditions that could cause failures, and determine if required maintenance is being performed. Qualified AFSC 3P1XX personnel will inspect weapons assigned to all organizations. The CATM section is responsible for obtaining tools and gauges required to accomplish the inspections and for ensuring gauges are calibrated at intervals established in T.O. 33K-1-100, *TMDE Interval Calibration and Repair Technical Order Reference Guide and Work Unit Code*. Organizations and individuals possessing weapons are responsible for coordinating inspections with all inspecting activities (CATM, Traffic Management Office, Packing and Crating, Supply, and Resource Protection), preparing the weapons for inspection, and for initiating and maintaining AFTO Forms 105 and DD Forms 1574, **Serviceable Tag Material**, for their in-use and extended stored weapons.

5.5.1. **Preissue Inspection.** Organizations receiving weapons from depot or another installation must have the weapons inspected by CATM personnel. All weapons, regardless of planned use (immediate operational use or placed in extended or mobility storage) must be inspected. This inspection consists of disassembly, gauging, lubrication if needed, assembly, and function check. If required, CATM personnel will initiate an SF 368, Product Quality Deficiency Report, according to T.O. 00-35D-54. CATM personnel will enter preissue inspections on the weapons' AFTO Forms 105.

5.5.2. **Inspection of In-use Weapons.** In-use weapons are weapons not in extended storage and used for operational and training purposes. This includes unit weapons used only occasionally for field training exercises. Semiannually inspect all in-use weapons for cleanliness, lubrication, and proper function. Perform a 10 percent disassembly (field-strip) and serviceability (gauging) inspection on each type of weapon to make sure unsatisfactory conditions do not exist. Inspect this 10 percent for cleanliness, proper lubrication, and serviceability according to applicable T.O.s and manuals. Remove sideplates on revolvers that are being inspected. If inspected samples indicate an unsatisfactory condition, inspect all similar types of weapons in comparable status possessed by that unit. This inspection may be accomplished at the time the weapons are used for firearms training. Inspect for serviceability, all spare barrels, tripods, traversing and elevating mechanisms, and other subassemblies of crew served weapons. Weapons not available for the inspection (temporary duty [TDY], in use, etc.) must be inspected within 15 duty days upon return from TDY or in-use status.

5.5.3. **Inspection of Weapons in Extended Storage.** CATM personnel will perform a complete serviceability inspection on weapons before the unit places them in long-term storage. Annually inspect 10 percent of the weapons each organization has in extended or mobility storage. If any unsatisfactory condition is found, inspect an additional 10 percent. If any unsatisfactory condition is found with the second 10 percent of the weapons, complete a 100-percent inspection of that type weapon owned by that organization. Give weapons inspected in extended or mobility storage a complete serviceability inspection. Select weapons to be inspected at random. Inspectors will ensure these inspections are performed so that weapons previously inspected are not reinspected until the entire quantity of weapons of that type have been inspected. Inspectors will plainly mark each container, box, and bag containing an inspected weapon. Annotate the inspected weapon's AFTO Form 105. These marks provide a visible indicator of weapons that have been inspected. After inspecting, CATM will ensure weapons are mechanically zeroed before repacking. When possible, base supply may wish to schedule one of their semiannual serial number inspections to correspond with the CATM annual weapon inspections.

5.5.4. **Preembarkation Inspections.** Inspect all weapons expected for deployment from CONUS to overseas locations or from any location to a potential combat zone to ensure these weapons are serviceable. Ensure all weapons being deployed meet or exceed minimum serviceability criteria using proper inspection tools and gauges. Weapons inspected and gauged within the last 60 days, and weapons packed in sealed barrier bags or containers having had a preissue inspection including gauging, are exempt from this inspection. Conduct preembarkation weapon inspections according to applicable base mobility or deployment checklists. These inspections may satisfy the semiannual or annual weapon inspection requirements.

5.5.5. **Post deployment Inspections.** CATM personnel will perform a complete serviceability inspection on weapons returning from deployments exceeding 30 days. Accomplish this inspection within 60 days on in-use weapons and within 120 days on weapons being returned to extended storage.

5.5.6. **Inspection Reports.** The CATM (AFSC 3P1XX) weapon inspectors will prepare written reports of all inspections conducted. The reports will include a statement that all weapons were inspected and those not listed by serial number were found to be serviceable. For those weapons on which open discrepancies are documented in the report include, weapon type, caliber, serial number, condition, and recommended remedial action (if necessary) for correction. Document discrepancies corrected at the time of inspections by the type and number of weapons and a brief description of the discrepancies. For example; "10 M16 rifles were found with light rust in the barrels. Closed." Route the reports through the appropriate unit commander to the action agency possessing the weapons. Within 30 days, the action agency (custodian or unit commander) must prepare an endorsement to the report and indicate corrective action taken (if required). The report will then be sent through their unit commander to the CATM section commander. Return endorsements are only required when the report has open discrepancies documented. If corrective actions were required and completed, the CATM section will perform a follow-up inspection within 14 days of the unit notifying CATM that corrective action has been completed. The CATM section will maintain copies of the last two unit inspection packages. Return endorsements from units noting corrective actions are an important part of the inspection documentation process. It is the responsibility of supported units to provide CATM the required endorsements.

5.6. Packaging of Weapons. The organization or unit possessing the weapons and the Traffic Management Branch (Preservation, Packing, and Packaging) are responsible for packaging weapons for shipment or storage. Before shipping any weapon, AFSC 3P1XX personnel will inspect the weapon and complete a DD 1577-2 (if required). The AFTO Form 105 must accompany the weapon in shipment. Weapons will be prepared and packed for shipment or storage according to applicable special packaging instructions (SPI) or T.O.s. For example, M16 rifles will be packed for storage or shipment according to SPI 00-856-6885, Special Packaging Instruction, M16 Rifle.

5.7. Tenant Organizations. The host-base CATM section will provide weapon maintenance support to those tenant units without their own AFSC 3P1XX weapons maintenance capability. This support must be formalized through an agreement according to AFI 25-201, *Host-Tenant Support Responsibilities of US Air Force Organizations*.

STEPHEN C. MANNELL, Brig General, USAF
Chief of Security Police

GLOSSARY OF REFERENCES, ABBREVIATIONS, AND ACRONYMS

References

The following is a complete list of publications related to Air Force Combat Arms Training and Maintenance (CATM) functions. Mandatory publications must be maintained within all CATM sections. Optional publications need not be maintained within the CATM section but must be available to CATM personnel (i.e. orderly room, base reference library, etc.) If training and or maintenance is provided for a weapon, all publications listed for that weapon, ammunition, and related equipment become mandatory.

Mandatory:

Air Force Publications

AFI 36-2201	Enlisted Specialty Training.
AFI 36-2226	Combat Arms Training and Maintenance Program.
AFMAN 36-2227	Combat Arms Training and Maintenance Vols 1, 2, and 3
AFH 36-2244	Combat Arms Training and Maintenance Handbook.
AFPD 36-22	Military Training.
AFCAT 21-209	Ground Munitions.
AFI 31-207	Arming and Use of Force by Air Force Personnel.
AFI 31-209	The Air Force Resources Protection Program.
AFMAN 91-201	Explosive Safety Standards.
AFM 50-62	Handbook for Air Force Instructors.

Tables of Allowance

TA 538	Security Police Activities and Organizational Small Arms Equipment.

Technical Orders--Other Than Weapons and Ammunition

0-1-01	Numerical Index, Alphabetical Index, and Cross-Reference Table Technical Orders.
0-1-02	General Technical Orders.
0-1-11	Armament Equipment.
0-1-43	Simulators/Training Devices.
00-5-1	AF Technical Order System.
00-5-2	Technical Order Distribution System.
00-35D-54	USAF Material Deficiency Reporting and Investigating System.
11W-1-10	Recording of Historical Data for Ground Weapons.
43E11-1-121	Small Arms Targets and Target Material.
TM 11-5855-214-10	Operator's Manual, Night Vision Sight, AN/PVS-4 (Army)
TM 11-5855-262-10-1	Operator's Manual, Night Vision Goggle, AN/PVS-7A (Army).

Ammunition

11A1-10	General Instructions-Munitions Serviceability Procedure.
11A13-6-7	Storage and Maintenance Procedures, 40mm Cartridges.
11A13-10-7	Storage and Maintenance Procedures, Small Arms Ammunition.
11A8-2-1	Hand and Rifle Grenades, 66mm Rocket Launcher, 81mm Mortars, 90mm Recoilless Rifle, 40mm Cartridges, Flares and Signals, Smoke Pots, and Land Mines.
11A13-9-7	Storage and Maintenance Procedures - 81mm Cartridges.

M16 Series Rifles

11W3-5-5-1	Operator's Manual, Rifle, 5.56mm, M16 and M16A1.
11W3-5-5-1-1	Maintenance and Repair, Submachine Gun, 5,56mm GAU-5A, GAU-5A/A, and GUU-5P.
11W3-5-5-1-2	Operation, Maintenance, and Repair, Conversion Kit, 5.56mm Rifle and Conversion Kit Magazine.
11W3-5-5-24	Unit and Direct Support Maintenance Manual, Rifle, 5.56mm, M16 and M16A1 and Bipod, Rifle, M3.
11W3-5-5-31	Operator's and Organizational Maintenance Manual, M2 Bolt.
11W3-5-5-41	Operator's Manual, Rifle, 5.56mm, M16A2.
11W3-5-5-42	Unit and Direct Support Maintenance Manual, Rifle, 5.56mm, M16A2.
11W3-5-5-61	Rifle, 5.56mm, M16, M16A1.

11W3-5-5-81	M16A1 and M16A2 Rifle Marksmanship (Army FM 23-9).

HANDGUNS

11W3-3-3-42	Field Maintenance, Cal., .45 Automatic Pistols, M1911 and M1911A1.
11W3-3-3-54	Field and Depot Maintenance Repair Parts and Special Tools List for Caliber, .45 Automatic Pistol, M1911A1.
11W3-3-5-1	Operator's Manual Pistol, Semiautomatic, 9mm, M9.
11W3-3-5-4	Unit and Intermediate Support Maintenance Manual (Including Repair Parts and Special Tools List), Pistol, Semiautomatic, 9mm, M9.
11W3-3-3-74	Operator and Organizational Maintenance Repair Parts and Special Tools Lists and Maintenance for Caliber, .45 Automatic Pistol, M1911A1 National Match and Caliber, .45 Automatic Pistol, M1911A1 National Match with Adjustable Rear Sight.
11W3-3-3-84	Operator and Organizational Maintenance Repair Parts and Special Tool Lists, Caliber, .45 Automatic Pistol, M1911A1, with Hip Holster and Caliber, .45 Automatic Pistol, M1911A1 with Shoulder Holster.
11W3-4-2-51	Operation and Service Instruction with Illustrated Parts Breakdown for Smith and Wesson Combat Masterpiece, Caliber, .38 Revolver, Model Number 15.
11W3-3-6-1	Pistols and Revolvers (Army FM 23-35).

Pyrotechnic Pistols

11W2-9-2-31	Field and Depot Maintenance Instructions, Ground Signal Projector M1A1, Hand Pyrotechnic Projector M9, and Pyrotechnic Pistol AN-M8, with Pyrotechnic Pistol Mount, M1.
11W2-9-2-34	Field and Depot maintenance Instructions, Including Repair Parts and Special Tools List, Ground Signal Projector M1A1, Hand Pyrotechnic Projector M9, and Pyrotechnic Pistol AN-M8, with Pyrotechnic Pistol Mount, M1.

Shotguns

11W3-6-1-154	Field and Depot Maintenance Instruction. Winchester Riot-Type Shotgun M12, Stevens Riot-Type Shotguns, M520-30, M620A.
11W3-6-1-171	Shotgun, 12 Gauge, M500/590 (Army TM 9-1005-303-14).
11W3-6-2-1	Intermediate Maintenance Instructions with Illustrated Parts Breakdown Military Shotgun, 12 Gauge, Pump Action Model 870, with Adapter Part Number 32911.

M79 and M203 40mm Grenade Launchers

11W3-9-4-1	40mm Grenade Launcher, M203, Operator's Manual (Army TM 9-1010-221-10).
11W3-9-4-2	Oganizational, Direct, and General Support, 40mm Grenade Launcher, M203 W/E (Army TM 9-1010-221-24).
11W3-9-2-2	Grenade Launcher, 40mm, M79 (Army TM 9-1010-205-10).
11W3-9-2-11	Grenade Launcher, 40mm, M79 (Army TM 9-1010-205-24).

Machine Guns (General)

OH 6-9	Machine Guns and Machine Gun Gunnery (Marine Corp Publication).M249 5.56mm MACHINE GUN (SAW)
11W3-5-5-51	M249, Machine Gun, 5.56mm (Army TM 9-1005-201-10).
11W3-5-5-52	M249, Machine Gun, 5.56mm (Army TM 9-1005-201-23/P).

M60 Series Machine Guns

11W1-12-8-41	Operators Manual, Machine Gun, 7.62mm M60, and 122 Tripod.
11W1-12-8-52	Organizational Maintenance Manual, Including Repair Parts and Special Tools List Machine Gun, 7.62mm, M60, W/E 1005-605-7710) and Mount, Tripod, Machine Gun, 7.62mm, M122 (1005-710-5599).
11W2-6-4-1	Operator's Manual, with Components List, for Machine Gun, 7.62mm, M60E3 and Mount, Tripod, Machine Gun 7.62mm, M122.
11W2-6-4-2	Interim Organizational and Intermediate Maintenance Manual,Machine Gun, 7.62mm, M60E3, and Mount, Tripod, M122.
11W2-6-4-11	M60 Machine Gun, 7.62mm (Army TM 9-1005-224-10).
11W2-6-4-12	M60 Machine Gun, 7.62mm (Army TM 9-1005-224-24).
11W2-6-4-14	M60 Machine Gun, 7.62mm (Army TM 9-1005-224-24P).

11W2-8-1-322	Machine Gun Mounts (Army TM 9-1005-245-14).
FM 23-67	Machine Gun, 7.62mm, M60.

M2, .50 CAL Machine Gun

11W2-6-3-161	M2, .50 Cal Machine Gun (Army TM 9-1005-213-10).
11W2-6-3-184	M2, .50 Cal Machine Gun (Army TM 9-1005-213-23P).
11W2-6-3-172	Organizational, Direct Support, and Depot Maintenance Instruction, Including Repair Parts and Special Tools List, Machine Gun, .50 Caliber Browning, M2, Heavy Barrel, and Mount.
11W2-17-4-1	M3 Recoil Amplifier, for M2, .50 Caliber Machine Gun (Army TM 9-1005-303-12&P).
11W2-6-6-1	Browning Machine Gun, Caliber, .50HB, M2 (Army FM 23-65).

MK 19 40mm Machine Gun

11W2-5-16-1	Operator's Manual and Components List, Machine Gun 40mm, MK 19 Mod 3.
11W2-5-16-2	Organizational and Intermediate Maintenance Manual, Including Repair Parts List, Machine Gun, 40mm, MK 19 Mod 3.
11W2-8-32-4	Mount, Machine Gun, MK 64 Cradle (Army TM 9-1010-231-13&P).
11W2-5-18-1	MK 19, 40mm Grenade Machine Gun, Mod 3 (Army FM 23-27).

M72A1 66mm Rocket Launcher

FM 23-33	66mm Heat Rocket, M72A1 and M72A2 (Army)

M29 81MM Mortar

11A1-1-1	Firing Tables, Mortar, 81mm, M29 and M1.
11WA1-4-3-1	Firing Tables, Mortar, 81mm, M29 and M1.
11W2-5-17-1	Mortar, 81mm, M29/M29A1 (Army TM 9-1015-200-10).
11W2-5-17-2	Mortar, 81mm, M29/M29A1 (Army TM 9-1015-200-20&P).
11W2-13-6-2	M53/M53A1 Sight Unit (Army TM 9-1240-287-34&P).
11W2-13-7-2	M45 Optical Boresight (Army TM 9-1240-278-24&P
11W2-13-8-1	M23 Ballistic Computer (Army TM 9-1220-246-12&P).
11W2-13-8-2	M23 Ballistic Computer (Army TM 9-1220-246-34&P).
11W2-5-13-11	Operator and Organizational Maintenance Instruction, 81mm Mortar and Mounts.
11W2-5-13-21	Instruction Manual, 81mm Mortar, M29, 81mm Mortar Mounts, M23 and M23A1, 81mm Mortar Baseplate, 23 and M23A1.
11W2-5-17-12	Mortar, 81mm, M29/M29A1 (Army TM 9-1015-2000-30&P).
TM 9-1000-202-14	Evaluation of Cannon Tubes (Army).
TM 9-6650-235-13&P	Operator's, Organizational, and Direct Support Maintenance Manual,for Borescope, M3 (Army). TM 9-4933-258-13&P Pullover Gauge Kit (Army).
11W2-5-17-21	Mortar Gunnery (Army FM 23-91).

M1 and M14, .30 Caliber Rifles

11W3-5-1-104	Operator, Organizational, and Field Maintenance Repair Parts and Equipment for Commercial Rifles.
11W3-5-4-4	Field Maintenance Repair Parts and Special Tools List for 7.62mm Rifle, M14, and Rifle Bipod, M2.
11W3-5-4-21	Operator and Organizational Maintenance Manual, with Repair Parts and Special Tools Lists for Rifles, 7.62mm, M14 and M14A2, and Bipod, Rifle, M2.
11W3-5-3-204	Rifle, Caliber .30, M1, M1C, M1D (Army TM 9-1005-223-12&P/1).
11W3-5-4-41	Rifle, 7.62mm, M14, M14A1 (Army TM 9-1005-223-10).
11W3-5-4-42	Rifle, 7.62mm, M14, M14A1 (Army TM 9-1005-223-20).
11W3-5-4-52	Rifle, 7.62mm, M14, M14A1 (Army TM 9-1005-223-34).
11W3-5-4-64	Rifle, 7.62mm, M14, M14A1 (Army TM 9-1005-223-12P).

M240 Series Machine Guns

11W2-6-5-1	M240, M240C, M240E1, Machine Gun, 7.62mm (Army TM 9-1005-313-10).
11W2-6-5-2	M240, M240C, M240E1, Machine Gun, 7.62mm (Army TM 9-1005-313-23P).
11W2-6-5-12	M240, M240C, M240E1, Machine Gun, 7.62mm (Army TM 9-1005-313-23.

Optional:

Department of Defense Directives

4160.21-M-1	Defense Demilitarization Manual.

Air Force Publications

AFIND 2	Numerical Index of Standard and Recurring Air Force Publications.
AFI 34-127	Excellence in Competition (EIC).
AFI 32-9002	Use of Real Property Facilities.
AFR 124-20	Carrying Firearms by Special Agents of the Air Force Office of Special Investigations (AFOSI).
AFI 91-202	The USAF Mishap Prevention Program.
AFI 91-204	Investigating and Reporting US Air Force Mishaps.
AFI 36-2848	AF Security Police Awards Program.
AFMAN 23-110	USAF Supply Manual.
AFI 32-8004	Standard Facility Requirements.

Tables of Allowance

TA 006	Oganizational and Administrative Equipment.
TA 629	Visual Information Support.

Technical Orders--Other Than Weapons and Ammunition

11W2-3-3-2	Bayonet-Knife M4, M5, M5A1, M6, M7.(Army TM 9-1005-237-23&P).
11W2-17-3-1	Blank Firing Attachment, M19 (Army TM 9-1005-314-12&P).
33K-1-100	TMDE Interval Calibration and Repair Technical Order Reference Guide and Work Unit Code.

Ammunition

11A1-42	General Instructions for Disposal of Conventional Munitions.
11A1-47	Explosive Hazard Classification Procedures.
11A1-60	Inspection of Reusable Munitions Containers and Scrap Material Generated from Items Exposed to or Containing Explosives.

Abbreviations and Acronyms

AFSC	Air Force Specialty Code
ANG	Air National Guard
BCE	Base Civil Engineer
CATM	Combat Arms Training and Maintenance
CE	Civil Engineer
CONUS	Continental United States
HQ USAF	Headquarters United States Air Force
MAJCOM	Major Command
N/A	Not Applicable
NCOIC	Noncommissioned Officer in Charge
OI	Operating Instruction
OJT	On-the-Job Training
PAFSC	Primary Air Force Specialty Code
STS	Specialty Training Standard
SDZ	Surface Danger Zone
TA	Table of Allowance
TDY	Temporary Duty
T.O.	Technical Order
WR-ALC	Warner Robins Air Logistics Center